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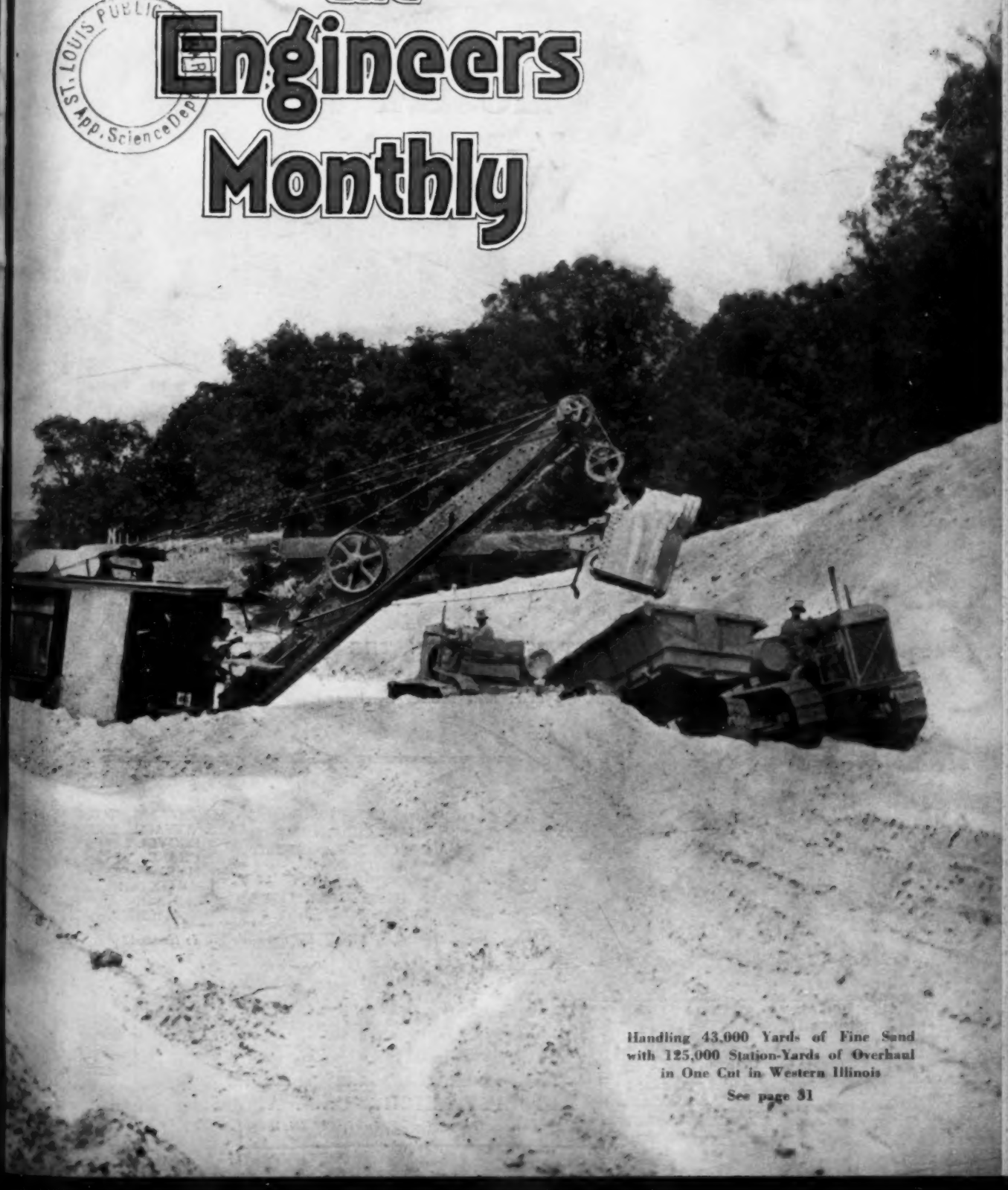

Handling 43,000 Yards of Fine Sand with 125,000 Station-Yards of Overhaul in One Cut in Western Illinois

See page 31

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New Methods—

The Result *of* Winter's Thought

Crawler Wagons to Handle Fill and Hand-Picked Concrete Crew Hastened Completion of 8.067-Mile Job

DURING the construction season when one thing after another takes up the attention of the superintendent there is little opportunity for him to develop new methods. During the winter when he can concentrate on these things there are great opportunities to cash in on the observations of the previous summer. W. D. Olsen, one of the Superintendents for the S. J. Groves & Sons organization and who was in charge of the grading and concreting on the 8.067-mile New Jersey contract between Weymouth and the Gloucester County line, as usual gave much thought to time savers last winter.

Three New Developments

The Ransome 27-E paver was equipped with a 24-foot boom so that it was possible for the paver to run along the grade, reach over a 10-foot slab that had already been poured but not opened to traffic, and pour a strip beyond. This meant considerable saving in routing the operations as much time was saved in moving to a new location and back again when the adjacent slab had been opened to traffic so that the paver could run on it. The spacing of the expansion joints 34.33 feet apart on the grade in New Jersey makes it difficult to run the paver on the subgrade of the strip being poured so that the boom 24 feet long works in very well with the general requirements.

The paver was equipped with a pan under the loading position of the bucket which caught all of the small leakage of grout which is inevitable with any type of bucket. Thus none of the grout was lost as the mixer oiler shoveled it over into the slab from the pan at frequent intervals.

The six dowels through the transverse expansion joints which are required by New Jersey specifications provide opportunity for the exercise of considerable ingenuity. Most contractors use some form of chair to support one end of the dowels in each group of three. This contractor used a device made of light angle iron and strap iron that fills the bill completely. With this device there is no chance for the dowels to wabble either on the side toward the paver or on the far side after the near side has been poured because they are held fore and aft by a twelve-legged device. Two equal-leg 1½-inch angles, 10 feet long with three 2 x ¼-inch straps bolted to them to space the angles which held the upright prongs which define the position of the dowels, have one leg turned in and the other up. This allows the straps to be riveted or welded to the horizontal legs and the prongs to the upright legs. The prongs

are formed of 3 x ¼-inch strap iron cut with a V at the bottom, ending in an arch the exact size of the dowels and at the proper elevation to hold the dowels firmly. On the under sides of the horizontal straps are two pieces of angle iron with the vertical legs close enough to fit over the metal cap of the expansion joint. These three sets of short angles line up the device so that every part functions properly. Every few joints and whenever the men had a few free minutes, they cleaned the concrete from the straddler with their concrete spades and oiled it. Thus at all times the device was accurate and ready to use.

The cement bags came in for novel treatment that produced almost uncanny results in the manner in which the bags showed up in the paver skip. At the cement shed or car the trucks received the seven bags of Allentown cement before the aggregates were placed in the compartments. At once you thought that there was danger of the cement bags getting damp from the sand. Well, that was taken care of by a canvas flap that was hung on the batch gates in the truck. When the cement bags, upside down, were placed in the compartment the canvas flaps were dropped over them. Then the sand was dropped on the canvas from the batcher, followed by the stone. At the skip, like sleight-of-hand, when the dumper tripped a batch, out shot the stone, then the sand, and last, right side up, the seven bags of cement all ready to be cut.

GRADING AND BUILDING A LONG FILL

On the rough grade the contractor put in four Lorain 75 shovels with 1¼-yard buckets and handled the spoil with nine Athey crawler wagons hauled by Caterpillar Sixties. To spread the fill into 6-inch layers and compact it by passing over every square foot 6 inches thick at least four times four Caterpillar Sixties with LaPlant-Choate bulldozers were used with one Adams leaning wheel grader with a 12-foot blade for the final trim. Only six hand laborers were used on all the rough grading and fill.

A fill 1,000 feet long to an overpass for a railroad was completed in three weeks by the use of one Lorain 75 and four of the Athey 8-yard crawler wagons. There was always a wagon at the shovel. The fill material was a sand, with a little clay binder, which handled like sugar and the wagons never stopped when dumping but moved to the spots indicated by the foreman and dumped right, left or back as directed and then returned to the shovel which was alongside the fill. During the early part of the fill it was possible for the wagons to mount the fill directly from the shovel but as the height progressed to the maximum of 30 feet they had to approach from the end. The shovel made a cut of about 5 feet over a large area to get the required amount of material without getting below ground water level. The crawler equipment worked with remarkable smoothness in the sand but the wear was severe because of the abrasive character of the material.

PREPARATION OF FINE GRADE AND FORMS

A hand-picked crew of twelve men handled the fine grade and form setting. The contractor was the first in the field in 1931, having started fine grade and concreting late in March. This gave him the opportunity to pick his skilled labor crews and the teamwork on this job showed the results. Having visited other jobs with the same superintendent, however, we can say that his ability to train green crews makes them close competitors for honors in teamwork. The fine grade crew was divided into six laborers following up the Warco one-man grader whose operator saw to it that the grade was about ready for concreting, an operator for the 5-ton Wehr roller, three men who set forms and one who realigned them ahead of the paver and finishing machine. Blaw-Knox 8-inch steel forms were used for the uniform thickness pavement which was 30 and 40 feet wide.

One man attended to the oiling of the forms and bulkheads, one man set the Elastite expansion joints at intervals of 34.33 feet and placed the six dowels through the joint. The dowels were covered with cardboard tubes on the side near the paver and supported by the device described at the beginning of this article. The superintendent had the tubes placed on the dowels on the side near the paver so that if for any reason it was necessary to remove a dowel after the concrete had set and before the slab beyond the bulkhead was poured the dowels could be pulled out readily.

SMOOTH OPERATION AT THE BATCHERS

A Blaw-Knox batcher plant was set up on a private spur of the Reading Railroad near the center of the job. The batcher plant was on one side of the spur track and the Link-Belt crane on the other side. A 50-foot boom handled the 1-yard Blaw-Knox bucket readily to unload both sand and gravel from the open cars to the three-compartment bins. Behind the crane there were three stockpiles for emergency and to save demurrage in case of congestion at the plant. The crane was used to move the freight cars as needed. The operating crew at the batcher plant consisted of the crane man, an oiler, two men in the cars to spot the bucket and clean up by hand, and one man on the bin. This group handled eleven cars of material each day, usually eight cars of gravel and three of sand. The batches were made up of 998 pounds of sand, 1,262 pounds of ¾-inch gravel and the same weight of 1½-inch gravel for the 7-bag batch. The gravel was furnished by Warner Co. of Philadelphia, Pa., and the sand by the Champion Sand Co. of Ocean City, N. J.

Elastite joint and National Steel Co. welded fabric for the reinforcing were received by rail and stockpiled at the batcher plant site with the Elastite stacked on top of the fabric to protect it from the weather.

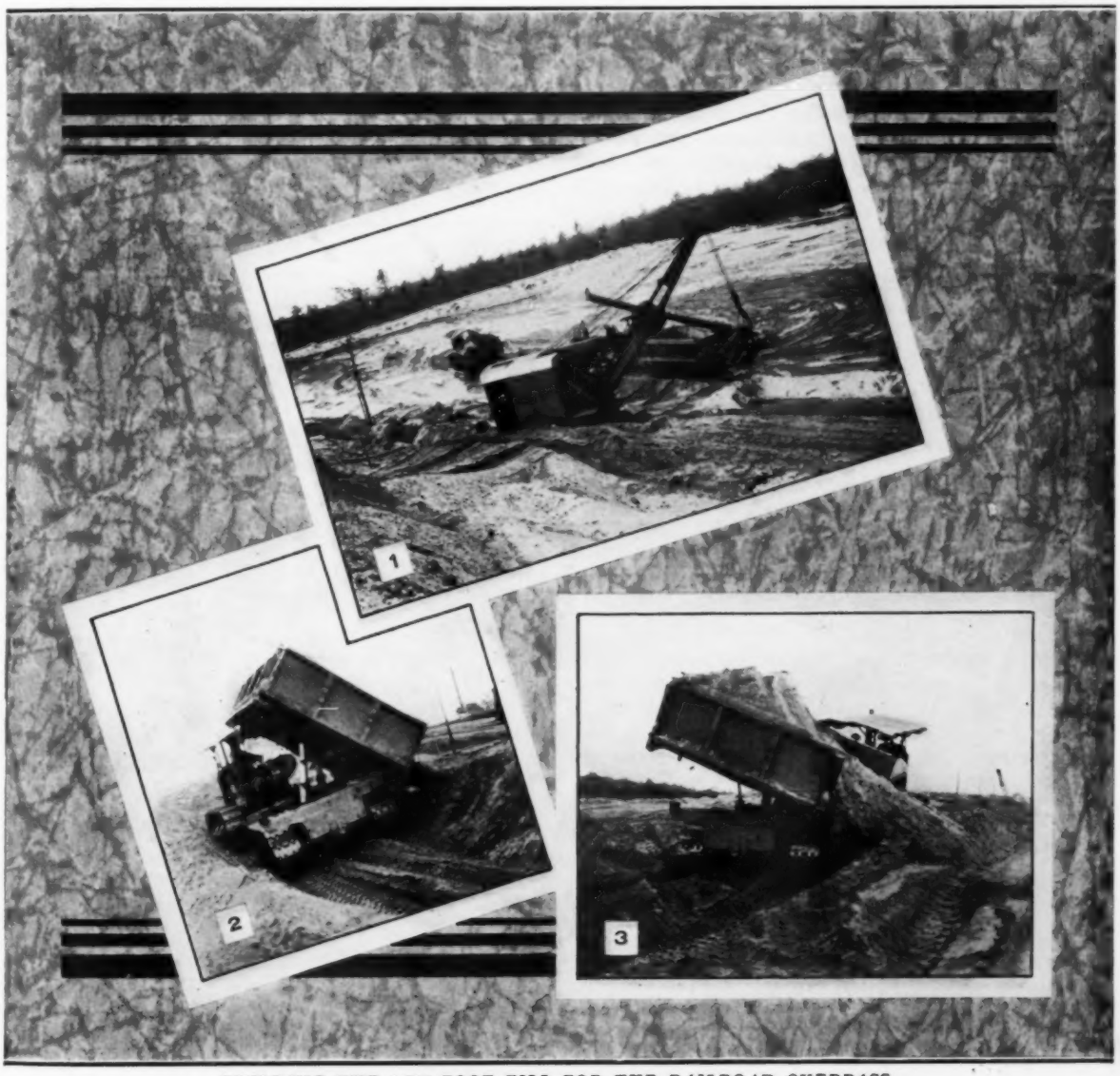
Allentown cement was received in box cars in the usual cloth bags and handled by three men at the cement car or shed as described above. A fleet of five new 4-batch 7½-ton Autocars, Macks and Sterlings were hired to do all the hauling on a per batch schedule. The batch trucks backed under the plant to receive the aggregates after having the cement bags stacked in the bottom of the compartments as described before. At the paver the trucks turned outside the forms. In fact, they never drove between the forms, as the 18-foot gravel shoulder provided ample room for maneuvering. This job was built with the 18-foot gravel shoulder continuous on the right-hand side of the road and an 8-foot shoulder on the left. There were two 10-foot strips of concrete on the left of the center line and one on the right.

ACTIVITY AT THE PAVER

The Ransome 27-E paver was the scene of unusual activity with the complete crew functioning as a unit. In addition to the paver operator, one man dumped the trucks, and two stepped into the skip as soon as the seven bags of cement shot out of the batch compartment, cut the wires and emptied the bags. One man picked up the empty cement bags and baled them for return. Two hose were carried on the paver with two 250-foot sections, one on each side of the three-way valve. As soon as the oiler for the mixer was free for a few minutes and the paver was less than 250 feet from the next tap on the water line he pulled the free hose forward with the help of such other labor as was free at the moment and connected it up, turned the three-way valve and the old hose was shut and the new connection ready to use. The paver carried the hose on the boom through two rings each about 6 inches in diameter, one at the end and the other at about the center of the boom and offset about 3 feet. This made it possible to carry the hose on the outside of the slab and have it entirely free from interference from trucks. The standard mix for 1931 paving in New Jersey is 1¼ minutes per batch.

The scheme of pouring on this job when running straight pavement was to pour two blocks to a depth of 6 inches ready to receive the reinforcing fabric and then return and pour the 2-inch top. The lower 6 inches was struck off by hand after the three shovel men had roughly leveled it off.

The two men who struck off the lower section also set the fabric and the corner reinforcing. In setting the fabric a smooth running method was used. The fabric was delivered to the job the proper width for the 10-foot slab and three mats to the block. As soon as



BUILDING THE 1,000-FOOT FILL FOR THE RAILROAD OVERPASS

1. *Loading the crawler wagons from a shallow cut over a wide area, working close to ground water level.* 2. *In making the fill the Athey crawler wagons never stopped, but dumped either to left or right at the spot indicated by the foreman.* 3. *Dumping a full 8-yard load near the top of the fill.*

one block was poured to a depth of 6 inches and struck off, the steel men pulled in three mats of fabric one on top of the other. The second and third were pulled forward, lapped under about 15 inches and wired to prevent their rising. In this manner there was no chance of the mats catching the screed as it passed over the top of the slab. Two men spaded the concrete at the sides with regular concrete spades. One hand finisher and two helpers followed the Ord mechanical finishing machine. They used a wood belt to give a uniform surface which was checked by straight-edging.

CURING—OLD AND NEW

During the early stages of this project it was required that the old method of curing with hay, sprinkled for seven days, be used. This required three men to spread the hay and keep it wet. Later the Federal authorities permitted the use of Curcrete and only one man was needed for curing.

WATER SUPPLY

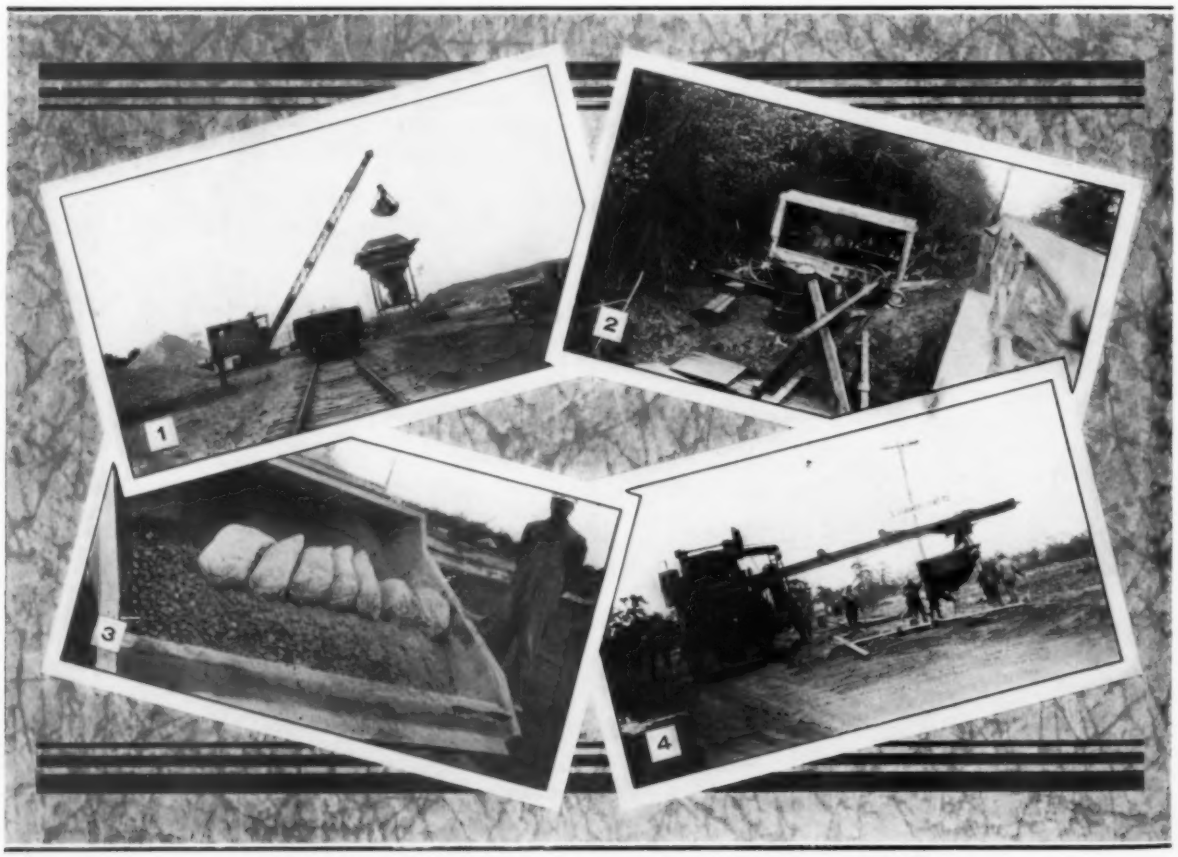
Water for the paver and for sprinkling when required was supplied by two road pumps, a Barnes pump at one end of the job and a C H & E at the other end. Each pump was located on the bank of a small creek. A 2-inch pipe line with taps every 300 feet for the paver hose carried the water along the shoulder.

QUANTITIES

Unclassified excavation	75,632 cubic yards
Borrow	136,853 cubic yards
8-inch reinforced concrete pavement	142,913 square yards
Preparation of subgrade	143,915 square yards
Gravel shoulder, 6 to 8 inches thick, 8 feet wide	38,892 square yards
Gravel shoulders, 4 to 6 inches thick, 18 feet wide	92,653 square yards
12-inch cast iron pipe	72 linear feet
18-inch cast iron pipe	1,668 linear feet
36-inch cast-iron pipe	360 linear feet
12-inch corrugated metal pipe	712 feet
Concrete catch basins	10 units
Wire rope railing	4,825 linear feet
Clearing and grubbing	80.9 acres
Bituminous macadam approaches	2,020 square yards
Reinforced concrete bridge approach foundation, 18 inches thick	425 square yards
Reinforced concrete foundation, 9 inches thick	577 square yards
Wooden curb on fills	3,410 linear feet
Two small bridges, concrete	220 cubic yards
Lump sum bid	$473,215.80

PERSONNEL

This contract which was started on January 28, 1931, and on which concreting was begun on March 30, 1931, was completed August 15, 1931, by S. J. Groves & Sons, Contractor of Ridgefield, N. J., under the direction of J. B. Matthews, District Superintendent with W. D. Olsen as Superintendent. For the State Highway Department, Frank W. Higgins was Resident Engineer.



MATERIAL HANDLING ON AN S. J. GROVES & SONS CONTRACT

1. A Link-Belt crane unloaded the aggregates to the stockpiles or direct to the Blaw-Knox weighing batchers. 2. This C H & E pump by the roadside furnished water for the entire job with a minimum of attention. 3. Seven bags of cement—all in a row—easily checked by the inspector and right end up for easy emptying. This is one of the superintendent's new schemes described in the text. 4. The Ransome 27-E paver with its 24-foot boom pouring concrete at an intersection.

Winter Concreting—

Methods *and* Details

The Third of a Series of Articles Dealing with the Practical Side of Cold Weather Concrete Construction

IN the January issue of CONTRACTORS AND ENGINEERS MONTHLY, an article on winter concreting set forth a number of important and practical details necessary to successful concrete construction during cold weather. More of these practical suggestions are contained in this concluding portion of the article.

INSULATING THE JOB FROM THE WEATHER

The protection of concrete after it has been placed is essentially two-fold—insulating the concrete from the low temperatures of the air by some housing or covering, and some means of supplying heat within this housing or covering to make up for losses by leakage and radiation. When portland cement is setting considerable heat is generated and the retention of some of the heat is often sufficient protection. In mild weather the wood form work itself and a covering of tarpaulin over the top surfaces may be sufficient protection. Tarpaulins hung over the form work also give further protection as the air space between the forms and the tarpaulin is a fairly good insulator. In colder weather, tarpaulins may be attached to a light frame built over the forms, leaving enough space for the placing of salamanders and the circulation of the warm air. Where the expense is warranted, the structure may be housed in a frame and wood sheathing, covered with paper or tarpaulin. This type of protection has been employed on many Canadian projects where the temperatures have fallen very low. In fact several prominent hotel structures with seasonal trade in the summer have been built of concrete during the winter completely within an outer insulated shell so that it was possible to maintain at least late spring temperatures if not summer weather within the enclosure.

Small structures may often be protected by a covering of straw. This should be placed in a deep layer entirely covering the concrete. The efficiency of this straw covering is greatly increased if it in turn is covered with tarpaulins.

HEATING THE ENCLOSURE

Salamanders, the most common method of supplying heat to enclosures, should not be placed so near any part of the concrete as to injure it by excessive heat or rapid drying. It is equally important not to place them too near wood forms on account of the danger of fire. This applies both to coke burning and to oil burning salamanders.

A detail which is rather obvious when called to the attention of a contractor but which is neglected in a great many structures is the protection of corner columns and the ends of walls which are the locations of greatest exposure and are most often frozen. Extra salamanders should be placed at these points. In concrete building it has been found that one salamander is usually sufficient for 300 to 500 square feet of floor area, depending upon the severity of the weather.

The use of steam heat has been mentioned before. The chief objection to it is the necessary piping, but since the steam is used at low pressure the piping need not be tight. In fact it is a distinct advantage as the escaping steam adds moisture to the air which will make up for losses by evaporation from the concrete. Furthermore, only a light weight pipe need be used. The running of such heating pipe is a simple matter and if the succeeding floors of a concrete structure are symmetrical, as is usually the case, no additional pipe cutting will be required for the upper floors. It is well to provide several risers so that one or more of them can be shut off while the heating pipe is being moved up or turned on immediately after casting a section of a floor. Since the steam pressure is low, neither a high pressure nor a new boiler need be used. An old boiler of 20 to 30 horsepower will furnish sufficient steam for the cold weather construction of a structure of a 5,000-square foot area.

CALCIUM CHLORIDE AS AN ACCELERATOR

According to the research of the Portland Cement Association, calcium chloride used as an accelerator may reduce the time during which protection of the concrete is required, but even where it is used, early protection of the concrete is necessary. The calcium chloride crystals must be dissolved in water before putting in

the mixer. The best method is to make a solution of known concentration and to use the desired quantity for each batch. About 2 per cent by weight of the cement is the most satisfactory. Preliminary tests are advisable to determine the exact effect on the particular brand of cement to be used and the time that protection must be provided.

EXAMPLES OF WINTER CONSTRUCTION

The December, 1931, issue of *Railway Engineering and Maintenance*, in an article on concrete construction in cold weather, describes the method employed on a grade separation job of the C. B. & Q., B. & O. C. T., the C. & N. W. and the Pennsylvania Railways in the vicinity of 16th Street and the Chicago River in Chicago. The work has been in progress during several winters. The protection provided on some of the long spans of the railway track elevation structure is of interest. Wooden frames covered with tarpaulin were supported on the form work. The frames and tarpaulins extended down the sides to the ground, completely enclosing the space below the slab. As soon as the concreting of a span had been completed the structure was completely enclosed. Coke salamanders were suspended about 4 feet below the forms and both coke and kerosene salamanders were placed above the slab. While outside temperatures as low as zero were encountered, the temperature inside the enclosure was maintained at 50 degrees F. or above.

Chicago also furnishes an interesting example attesting to the fact that winter-poured concrete can be first class and of high strength. In the latter part of 1930, the city of Chicago built a new bascule bridge across the Chicago River at Wabash Avenue. Since the south abutment of this bridge occupied a portion of the broad plaza of Wacker Drive, at this street a large area of the reinforced concrete deck slab of the Drive and several supporting columns had to be removed. The concrete in this portion of Wacker Drive was placed on January 6 and 7, 1926, as a part of a pour that started on January 4 and continued without interruption for 99 hours. The weather which was favorable at the beginning of the work became severely cold later, but at the time this particular portion of the Drive was placed the weather had moderated somewhat and turned into a snow storm. The temperature in the air above the slab varied from zero to slightly below freezing. All materials were heated to give temperatures in the fresh concrete of about 80 degrees F. at the mixer, about 60 degrees F. at the forms and about 35 to 40 degrees F. at the upper section of the slab by the time it had hardened sufficiently for workmen to cover it with straw. The air beneath this slab, heated by salamanders, varied from 55 to 85 degrees F. through the curing period of seven days. Under the hay, the surface of the slab showed comfortable temperatures for the entire week well above the usual specifications of 50 degrees F. as a minimum temperature.

During the demolition, chunks of concrete were taken from the débris and tests were made of small cubes representing both slab concrete above and paving base concrete. These showed an average crushing strength of 11,400 pounds per square inch for the superstructure concrete and 10,200 pounds for the paving base.

A Treatise on Underpinning

TWO prominent New York engineers whose experience in underpinning probably far surpasses that of any other pair of men in the world have presented to the engineering fraternity and to contractors a book on underpinning, supplanting their earlier publication "Modern Underpinning" published in 1917. In the introduction to this book by Edmund Astley Prentis and Lazarus White of Spencer, White & Prentis, New York, William A. Starrett expresses the spirit of the volume thus, "Underpinning . . . . is a volume rich in the applied new science of difficult foundation construction; an answer to the riddle of only yesterday, and a veritable treasure-trove of valuable experience and knowledge of the subject. Perhaps one of its unique qualities is the generous outgiving of special knowledge that, without any violation of engineering ethics, might easily have been withheld, the business interest of the authors considered. We learn from the volumn how all of their most difficult problems were met and solved, how research had to be undertaken in the midst of a great project—where precedent failed to give the clue to the solution, and where, above everything else, safety at all times had to be maintained. All of the ingenious new devices are explained, and, in a spirit of candor that pervades the whole work, unsolved problems are freely admitted."

This valuable volume devotes an entire chapter to general considerations of foundations and underpinning, including subsurface exploration, movements of buildings, examination of buildings, settlement, lateral support, repairs, etc., following which shores, needles and grillages are discussed. Then comes a chapter devoted specifically to underpinning methods with the following chapter filled with a remarkable group of examples of underpinning and a chapter on applications of underpinning methods to other work.

The concluding chapter discusses some aspects of the science of foundations and three appendices cover the specifications for underpinning including payments, legal aspects of underpinning and foundation work and present rates of pay. The book concludes with a glossary of common terms used in underpinning and a well prepared index. "Underpinning," published by the Columbia University Press, New York, is priced at $7.50.

A Sheepsfoot Tamper in Action

TAMPING AN APPROACH FILL FOR THE NEW AURORA AVENUE BRIDGE OVER LAKE UNION, SEATTLE

R. J. Odman, Contractor, Seattle, Wash., tamped the 40,000 yards of earth fill with an Ateco sheepsfoot tamper pulled by a Cletrac tractor

A Novel Bulk Cement Handling Plant

Batching and Dumping Bulk Cement

N. M. Isabella of Madison, Wis., Developed Method That He Has Used Under Varying Conditions With Only Slight Changes in Plant Set-Up

BULK cement has certainly set contractors to thinking. When a new material or method of using an old material appears on the scene, both manufacturers and contractors try their best to produce equipment and devices to use that material or method to the best advantage. N. M. Isabella, paving contractor of Madison, Wis., and formerly a Division Engineer of the Wisconsin Highway Commission, started three years ago to take advantage of the lower cost of bulk cement for state highway work. At that time he had a particularly advantageous setting for a plant to handle the cement in a steep cut. The bulk cement was delivered to the hopper by driving on top of the cut and the trucks receiving the batched cement ran at grade. Such a happy combination is not always available so he thought out a method that could be used right out in the flat country which abounds in some sections of Wisconsin.

A typical Isabella bulk cement handling plant was used on his paving contract this past summer on State Highway 73 running from Plainfield easterly toward Wautoma, a distance of 11.3 miles. The loose cement was shipped in box cars from Manitowoc, Wis., to Plainfield and hauled 7 miles by five Chevrolet trucks with steel bodies covered with canvas during the trip. At the dock four men shoveled direct to the truck when the car doors were first opened and then when the door was clear they loaded concrete buggies and wheeled to the trucks.

To replace the convenient cut the contractor built a trestle or ramp up to an elevated hopper into which the trucks dumped the cement after backing up the ramp. The hopper was lined with sheet metal to permit the cement to slide easily to the control gate through which it ran to the buggies. In the early plants the hopper was built rectangular in form for the top section and then sloping from all four walls to the control gate at the bottom. This was later changed to having a straight wall at the front and the other three walls sloping from the top in to the control gate. This gave no corners for the cement to catch and pack. The three sides were therefore triangular in form, the back being an equilateral triangle and the others right angle triangles with the right angle at the top and front.

Only three men were needed to care for the cement on the dock. One loaded the cement buggies, one wheeled, weighed and dumped into the batch trucks and a third covered the cement in the trucks with sand to prevent blowing and consequent loss. A depressed roadway for the batch trucks made it possible to build a low ramp for the cement trucks. The relation between the height of the ramp and the depth of the

depressed roadway depends on the power of the two fleets of trucks and the weight of the load of cement and of the proportioned batches which are being delivered and hauled away respectively.

To make the dumping of the batches of cement easy and accurate a drop platform was used which rested on the side of the truck. A rim of 1 x 2-inch material acted as a stop for the buggies so that they would not run off into the batch truck. The platform was raised to release each truck and to permit the cab of the next truck to clear. The batch trucks hauled only two batches per load. All batch handling was done by subcontract by Jordal of Minneapolis, Minn., who used a fleet of International trucks.

AGGREGATES PRODUCED ON THE JOB

The aggregates for the job were produced by subcontract by John Gunnison & Sons Co., of Madison, Wis., in a pit located about one-quarter mile from the right of way at a point 5.1 miles from the west, or Plainfield end, of the contract. Three Ford trucks with Galion Allsteel and Anthony bodies hauled the material from the pit shovel to the hopper of the primary belt conveyor. The plant produced two sizes of stone and washed sand. The stone was delivered to stockpiles convenient to the first Butler bin in which two stone batchers were installed and the sand was carried by a flume to a pile below the sand batcher, which also was a Butler plant. An Insley crane with a ½-yard bucket handled the sand from the primary stockpile to the batcher or to another stockpile at the elevation of the foundations of the bins. A Koehring gas crane with a 1-yard Williams bucket handled the stone from the stockpiles to the first batcher plant. The batches were made up of 1,508 pounds of sand, 1,017 pounds of pea gravel, and 1,870 pounds of coarse gravel for a batch containing 643 pounds of cement and designed to yield 33 cubic feet of mixed concrete in the road.

The aggregate batching plant was located about one-fifth of a mile from the cement batching plant. The trucks drove into the plant and backed under the stone batcher, after receiving their two batches of stone drove forward and then backed under the sand batcher. Then they drove uphill to the cement batching plant.

ROUGH GRADING ALSO DONE BY SUBCONTRACT

The rough grading on this job was handled by William Lathers, Jr., of Madison, Wis., who moved about 15,000 cubic yards of earth per mile. He used two Caterpillar Sixties and five Thirties and three Highway Trailer automatic loading wheeled scrapers. The tractors also pulled 1 and 2-yard Euclid Tumble Bug rotary scrapers, and 8, 10, and 12-foot blade graders on the fills.

PREPARING THE FINE GRADE

The fine grade and form setting crew kept the 9-inch Lakewood steel forms set 1,000 feet ahead of the paver and the actual grade close behind. Three men handled all the form setting, the trench for which was prepared by a Wehr power grader with Fordson power. The subgrade crew consisted of five hand laborers in addition to the machine operators. A Caterpillar Thirty with a 5-foot Euclid rotary scraper cut the high spots in the grade and a Lakewood subgrader trimmed the grade to the specified cross section of 9—6½—9 inches ready to be rolled by the Wehr power roller. Just ahead of the paver there were two men dressing the forms who also handled the oiling of the forms and filling ruts developed by the trucks. The trucks were turned well ahead of the paver on a Freeman two-way turntable. There were a number of sandy stretches in the subgrade where it was necessary to use steel plates to insure proper traction for the heavy batch trucks and to prevent the miring of the transportation units. One truck tied up near the paver with no place to get by it means the shutting down of the entire operations until it is pulled out.

POURING 1,250 LINEAR FEET PER DAY

To maintain an average of 1,250 feet of the 20-foot slab per day Mr. Isabella used a complete, but not overmanned organization. One man handled the dumping of the trucks and cleaning the bodies as these arrived at the skip of the Koehring 1931 Model 27-E paver. The 33-cubic foot batch was mixed for 50 seconds in the paver. The paver operator used the spreader bucket to good advantage to cover a large area with the "mud" and cut the work of the puddlers. The paver pulled a Carr trail grader which kept two men busy shoveling. There were two men on steel, placing the 4-foot dowels across the continuous longitudinal center joint at intervals of 2 feet, and also ten of the ½-inch deformed bar dowels across each transverse plane of weakness spaced 30 feet apart. The expansion joints at intervals of 90 feet were made up by the insertion of a 1-inch bulkhead with slots for the dowels to pass through. All dowels across the expansion joints and transverse planes of weakness had metal sleeves on one end. In sections where steel fabric was laid because of the weakness of the grade an extra man was put in on puddling and steel. Usually there were but three puddlers.

A Lakewood finishing machine with two screeds smoothed the surface to an even 1-inch crown with two or more passes over the green concrete. This was followed by the power-operated Flex-Plane machine which inserted the continuous center slot and the transverse slots. There were two men on this who alternated on the continuous center slot and worked together on the transverse slots. They carefully hand-floated over the tops of the wedges to insure an even surface for the straight-edging behind. Two men with a 10-foot longitudinal float worked from a pair of rolling bridges connected with frames at the sides, and also did the straight-edging and belting.

One head finisher with the two longitudinal float men worked together when lip curb was being installed. This is a curb about 12 inches wide and 3 inches high, wedge shaped, which prevents water flowing off the edge of the pavement on curves and down long slopes. It is an economical method of preventing wash of the shoulders in places where water is bound to collect. A horse and a stone-boat were used to haul the concrete back for the lip curb. Two men put up the forms and hand finished at once. The head finisher with the two regular finishers edged the pavement and pulled the wedges from the planes of weakness and cleaned the slots where necessary.

Two men handled the spreading of the burlap which

was spotted along the grade ahead of paving in rolls of one piece per roll. They also sprinkled the rolls before spreading on the new pavement. The wet burlap was first stretched out on a rolling bridge and then lifted to the slab. It was also sprinkled after placing on the concrete. The work of covering the pavement with earth the day following pouring was handled by a subcontract by three men on a price-per-foot basis. These same men also pulled the forms and loaded them on the contractor's wagon for hauling ahead. There was a maximum of seven sprinklers from the contractor's own organization.

WATER SUPPLY

Sufficient water for all operations was furnished by a Rex triplex pump and a line of 2½ and 2-inch pipe laid along the shoulder. Taps were inserted every 240 feet for the paver hose and for sprinkling. The paver carried 150 feet of 2-inch Roadbuilder's hose supplied by Cunningham-Ortmayer of Milwaukee, Wis. This hose was equipped with U. S. Rubber Co. Samson high-pressure clamps which did away with the leakage so common around connections to the pipe line and between lengths of hose.

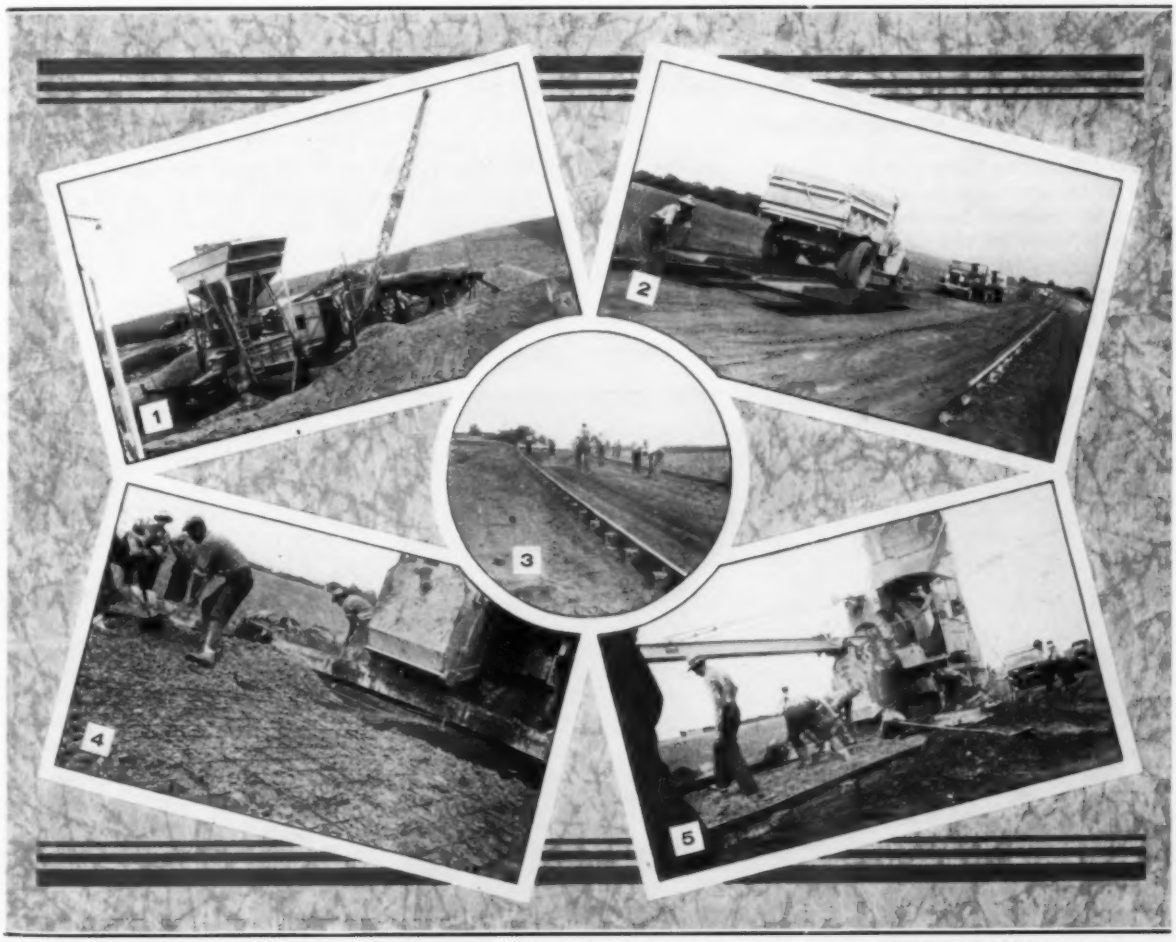
FILLING THE JOINTS

The slots of the planes of weakness and the 1-inch expansion joint were filled with tar by one man with a hand pouring pot on the day following the pouring of the pavement. A Littleford tar kettle was pulled along the pavement slab to heat the tar to the right consistency.

PERSONNEL

This 11.3-mile paving contract was completed by N. M. Isabella of Madison, Wis., who was active in the work throughout the progress of all operations. He was assisted by his nephew, J. J. Isabella, as Superintendent. S. A. Tate was Resident Engineer for the Wisconsin Highway Commission on this contract.

A practical discussion of the governing factors and methods of figuring blast hole drilling costs, a careful study of which will help our readers in a more economical and efficient use of this method of drilling, will be among the featured articles of the March issue of CONTRACTORS AND ENGINEERS MONTHLY



AGGREGATE PRODUCTION, GRADING AND CONCRETING NEAR PLAINFIELD, WIS.

1. A Koehring crane loading one of the two Butler aggregate bins. 2. Swinging one of the batch trucks on the Freeman turntable. 3. Shoveling out excess dirt from the fine grade behind the Lakewood subgrader. 4. The 4-foot dowels across the center joint and a mat of reinforcing steel in the foreground placed because of weakness in the grade. 5. The Koehring 27-E paver which poured an average of 1,250 feet of 20-foot slab a day.

Preparing 1,200 Holes for Blasting

Material Handling

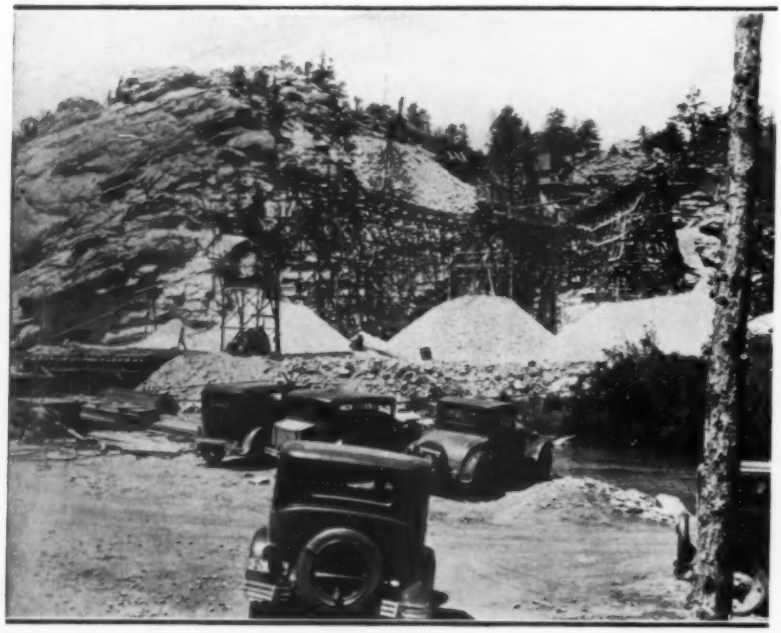
GOOD progress was made during 1931 on the Eleven Mile Canyon Dam, for the Denver, Colorado, Water Department. The dam is 54 feet thick at the base and 15 feet at the top, where a roadway crosses. The overall height is 147 feet, with a spillway 112 feet above the old river bed. The dam will be 445 feet long and will impound 80,000 acre-feet of water—a most unusual amount for the height of the dam. This is due to the fact that just above the dam the canyon spreads out into a considerable valley.

Sand from Quarried Material

An interesting feature of the job is the fact that it is one of the very few on which sand manufactured from quarried material has been successfully used. In this case the material was fine grained white granite. The sand had to be graded with many fines, 90 per cent passing a ⅛-inch mesh and all crusher dust was left in. With this sand, and two grades of crushed rock, the larger of which reached 8 inches, a workable concrete was obtained with the use of five sacks of cement per cubic yard. Test cylinders showed a strength of 2,000 pounds at 7 days, and 4,000 pounds after 28 days. The concrete was vibrated with Vibro-Cast equipment so that no admixtures were needed.

Aggregates for the job were quarried from the mountainside near the dam, where a crushing and screening plant was installed. Two Gardner-Denver water-liner drills were used in the quarry, drilling 20-foot vertical holes and 20-foot lifters 8 feet apart. The face was blasted in benches. Some secondary blasting was necessary to reduce the larger rocks. Shallow holes were drilled and ½ to 1 stick of dynamite used.

No electric power being available at the dam site it was necessary for the contractor to install his own power plant and power for equipment. Air for the quarry was piped from a Sullivan 600-foot and four Ingersoll-Rand compressors installed below the dam. These were driven by a Fairbanks-Morse full diesel 120-horsepower engine and were all connected so as to be used singly or together.



The Quarry and Aggregate Plant

At the quarry, rock was loaded by a 1-yard Koehring and a 1½-yard Lorain shovel into 5-yard Mack dump trucks and hauled to the Buchanan 30 x 42-inch crusher at the edge of the quarry. The crusher was driven by a 180-horsepower Buda M.A.N. diesel engine. Two sizes of rock and one of sand were produced. From the primary crusher the rock passed over a 24-inch belt, 40 feet on centers, to a Bartlett & Snow 60-inch x 24-foot cylindrical screen, driven by a 54-horsepower LeRoi engine, which also drove the belt. The ¼ to 2½-inch rock from the first section of this screen passed by gravity to a 3-foot Symons cone crusher, which converted it into sand which was delivered over an 18-inch belt conveyor, 90 feet on centers, to an 84 x 88-inch double-decked Traylor vibrator screen. This conveyor carried the fines from the first section of the cylindrical screen direct,

on a Colorado Dam

By
Joseph C. Coyle

Loading the Skips at the Bottom of the Excavation

and also received fines from a 15 x 38-inch Wheeling secondary crusher.

Sand under ⅛-inch from the vibrator screen was delivered to storage over an 18-inch conveyor belt, 100 feet on centers. Material from ⅛-inch to ½-inch was returned to the Symons crusher over an 18-inch belt, for recrushing. Oversize from the Traylor screen was diverted over a cross belt to an 18-inch conveyor, 220 feet on centers, which also carried ½-inch to 2½-inch rock to storage from the Wheeling crusher, which reduced the oversize of the cylindrical screen. Both the Wheeling and Symons crushers were driven by a 120-horsepower Buda M.A.N. diesel engine. The 2½ to 8-inch rock from the cylindrical screen passed directly to the storage pile over an 18-inch belt, 220 feet on centers.

Excavation

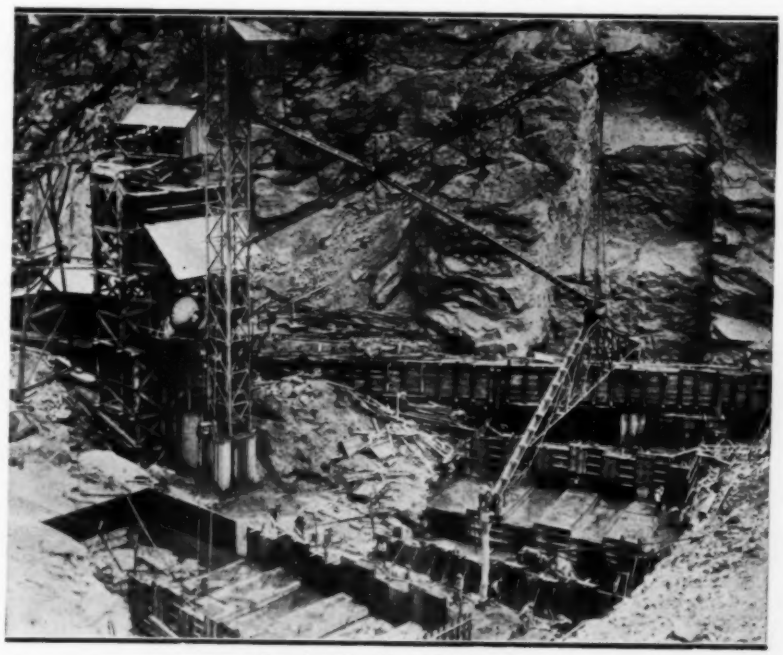
Preliminary exploration of the dam site was under the direction of Engineers of the Water Department, T. S. Lovering, U. S. Geological Survey, and Ira Williams, Consulting Geologist, of Portland, Oregon. After extensive drilling it showed the site to be free from faults. Excavation for the abutments was started at the top, on each side of the canyon, the small amount of over-burden being stripped off and the trenches stepped out with short holes and light charges of dynamite. Waste rock was moved largely by gravity down to where it could be handled with the 1-yard Koehring and a 1½-yard Lorain shovel. A number of Gardner-Denver and Ingersoll-Rand jackhammers were used in drilling. A Gardner-Denver oil forge and two Gardner-Denver sharpening machines were used in sharpening steel.

In the bottom of the canyon the excavation reached a maximum depth of 32 feet. Waste material was removed by the power shovels to skips, raised and loaded into dump trucks. The small amount of seep water encountered was removed with a 5-inch American-Marsh and two 2-inch Swaby gas-driven pumps. About 300 holes were drilled in the rock and plugged, then fired with fuses, a few at a time. Blasting was begun at the middle of the excavation, breaking a trench through first and then shooting from each side. All blasting was confined to short holes and light charges to avoid shattering the walls of the excavation. Hercules 75 per cent Gelax and du Pont 40 per cent gelatin dynamite were used both in the excavation and the quarry. Grout holes were used ahead of the concrete work, but little grout was required, owing to the very tight rock formation.

Handling Aggregate to the Mixer

A 24-inch belt, 150 feet on centers, was installed in a tunnel beneath the three aggregate stockpiles, delivering the aggregates to another 220-foot belt of the same width, which carried them to wooden hoppers above the Blaw-Knox weighing batcher plant. One

(Continued on page 32)



Pouring the Base of the Dam

How the Other Fellow Did It

Construction Briefs

A Pick on Hand Is Worth a Dozen a Mile Away

133. Clean-up men and final grade crews are not infrequently in need of picks in a hurry, no matter how much care may have been taken to complete the fine grade. One concrete contractor made it a point to keep several picks hung on the paver bucket where they could be reached in a second to pull up an offending stone or other part of the grade that was shown to be high by the scratch template. 21.5.67

Drilling Economy

134. There are two main factors of economy of drilling time: first, setting up the drills and making footage at the maximum speed and second, eliminating drilling beyond the depth which is practical for the round to pull. The use of drill carriages mounting four drills for an 8 x 8-foot heading and carrying the air and water manifolds and hose, so that only one compressed air and one water connection have to be made, cuts the setting-up time to a maximum of 20 minutes after the carriage with the drills arrives at the face.

On three-shift operations, where each shift is a complete cycle, the depth of the round is limited to the depth of cut that can be pulled by a single blast. Where there are only two drill shifts the cut can be blasted twice and hence the depth of the round increased. In very easy drilling ground, the cut can be drilled still deeper and blasted three times but as a rule after the second blast the remaining sections of the cut holes are enlarged to such a size that the proper loading to exclude air spaces in the charge and good confinement is difficult and the efficiency of the explosion is lost. In high speed tunnel driving the explosive cost is always high as compared with what it is when time can be relegated to second place and economy can be made the main object.

After the depth of round that will give the maximum advance per shift has been determined upon, great care should be taken in the drilling of holes so that each one will have the proper angle and depth. The holes of the V-cut should be started midway between the center line and the rib line so that they will have the maximum swing and still meet, or nearly meet, at the points. The squaring-up holes should be stopped from 12 to 18 inches in front of the bottom of the cut holes in order to avoid leaving guns in the face. These not only mean wasted drilling but also retard and interfere with starting the holes of the next round in the proper position. 21.3.98

The Rub Between the Paver Bucket and the Scratch Template

135. It not infrequently happens that a minor piece of equipment or an attachment for a machine outlasts the machine itself and is transferred to some newer piece of equipment. One contractor had a scratch template which was built for a certain make of paver but was using it on another paver. He experienced some trouble in the concrete bucket catching on the scratch template when both were close to the paver. To correct this the wheels of the template were set higher, thus throwing the top of the template lower and the bucket cleared it at all times. This saved a few seconds every time the paver was moved, but lost seconds mount into minutes in the course of the day and finally the run is cut by a number of feet each day. 21.5.67

A Novel Stockpile Layout

136. A New Jersey contractor was forced to produce his own aggregates by opening a local gravel pit. Delivery direct from the washing plant to the stockpiles could not be made economically so he handled all aggregates by truck. In order to facilitate the handling of three sizes of aggregates with one crane he laid out his stockpiles in a semi-circle with the weighing batcher as a center. He laid out a ring of 40-foot radius and erected a barricade. This left sufficient space for the steam crane to operate and the barricade acted as the starting point of radial partitions 45 degrees apart, except for an open space of 90 degrees which made up the driveway at the front of the batcher. Thus there were two compartments for each size of aggregate. The trucks dumped into one section for one day while the crane loaded from the other section. This gave ample opportunity for the aggregate to drain and thus maintain a practically uniform moisture content. It also eliminated any interference between the stock trucks and the crane. 21.4.65

Well Casing Piles and Cribbing Hold Sidehill Rock Job

137. Unless ground is very stable and the slope gentle, sidehill fill is difficult to handle. A peculiar problem along these lines presented itself on an eastern Pennsylvania job. At the outer edge of the road the ground sloped off sharply to the bank of the river. In order to retain this bank at the elevation decided upon for the concrete highway, piles were used with concrete cribbing. The contractors drove 42 piles with a small pile driver in a distance of about 400 feet. The well casings were driven to a depth of 50 feet and then a 6-inch I-beam was inserted and the whole concreted. The 10-inch diameter casings were anchored across the road to rock or to dead men, where rock was not available. Concrete beams 10 feet long and 12 x 12 inches in section were laid up as cribbing behind the well casings. 21.3.79

Give a Thought to Your Grading Equipment

138. Many contractors say that there is no money in grading for a concrete paving job and that they do not begin to make money until the slab is being poured. One Pennsylvania contractor kept track of grading costs for several years and then began to use the equipment which showed the least cost on different types of excavation and grading. For instance, he now uses only graders for light cuts and keeps his power shovel away. He uses wheeled scrapers for moderate cuts as they have proved to be cheaper than the shovel or the grader. Then when he gets into heavy cuts, he put in a 1¼-yard gas shovel. More thought along these lines will mean lower total grading costs on your next job. 21.4.74

Ripping Up Street Car Rails

139. More and more are contractors called upon to pull up street car rails where the good old "electric" has been supplanted by bus transportation. A New York State contractor devised a novel scheme as an attachment to his crawler shovel. A roller yoke was suspended by a chain from the bucket teeth and fastened to the front axle of the machine by a cable to hold it in position. The machine was then backed away, and the yoke run along the track, pulling it out of its foundation quickly and economically. The same shovel was used to excavate along the rail for the new pavement. 21.3.107

Working a Shovel *and* Crawler Wagon Outfit

Paul T. Pfeifer & Co. of Rock Island Took Subcontract for 43,000-Yard Cut in Fine Sand North of Geneseo, Ill.

Dumping One of the 7-yard Crawler Wagons

ON an extensive grading contract for which H. H. Enbody & Son, of Aurora, Ill., had the major portion of the work, involving about 1,000,000 station-yards of overhaul, Paul T. Pfeifer & Co. handled the largest single cut with a shovel and crawler wagon outfit. This single cut involved 125,000 station-yards of overhaul which was put on the contract plans but meant little as far as bidding was concerned. The specifications state that there shall be 500 feet free haul and a certain amount of overhaul is also stated but it is required that the entire cost of the overhaul be taken care of in the unit bid of the contractor.

This large cut north of Geneseo on State Route 82

A Bucyrus-Erie ¾-yard Shovel Loading One of the Western 7-yard Crawler Wagons

required the handling of 43,000 yards of fine sand from a cut with a maximum depth of 38 feet. The grade of the road to the north from the cut was 6 per cent for the finished highway but much steeper in the haul for the crawler wagons with their loads of sand. The back slope of the cut was 1½ to 1 at which angle the sand stood very well.

Work on this cut was started June 19, 1931, and completed August 3, 1931, with a Bucyrus-Erie 1-yard Gas + Air crawler shovel and five Western 7-yard bottom dump wagons with Athey truss wheels, each pulled by a Caterpillar Sixty. The cut was worked in five lifts of 8 to 9 feet each with the shovel loading the wagons with a heaping pile of sand that measured a full 8 yards on each trip. As the need for fill extended for a considerable distance the balance was not reached without a maximum haul of 2,000 feet and the average haul was around 1,000 feet. The wagon loads were spotted along one side of the fill and knocked down by the empty wagons as they pulled out. The material was then spread across the fill by the tractors. After a section had been raised about one foot in rough grade one of the Sixty tractors was used to pull an Austin-Western 12-foot blade grader to smooth the grade to a 9-inch lift. Where any black dirt in clods or lumps appeared the contractor was required to use a disc harrow to break up the lumps. No bulldozer was used on the dump at any time.

Working from 5.30 A.M. to 6.00 P.M. with one-half hour lunch period, this outfit of shovel, tractors and crawler wagons manned by five "cat skinners," a shovel man, two wagon winders and a dump man, moved 1,000 yards of sand a day.

This work was done under the direction of E. C. Pfeifer for the contractor, and of R. H. Scales, Resident Engineer for the Illinois Division of Highways.

Material Handling on a Colorado Dam

(Continued from page 29)

man was required in the tunnel, to regulate the flow of aggregates. Aggregates passed by gravity from the wooden hoppers to the weighing batcher and then to the Smith 2-yard mixer. Cement was elevated from a storehouse to a bin above the batcher by an inclosed bucket elevator and was weighed in bulk. The concrete skip, loaded by gravity, was operated by a Clyde two-drum hoist, driven by a Climax Blue Streak gas engine.

POURING CONCRETE

Concrete was poured through 16-inch steel gravity chutes, on a 60-foot boom, from a 260-foot Insley tower. Water for mixing was measured through a 2-inch Neptune water meter. The concrete mixer was formerly used at the Coolidge Dam, the chute lines at Saw Pit Dam, near Los Angeles, and the remainder of the mixing plant was brought from the Big Tujunga dam project. It is a 50,000 cubic yard plant, designed to handle 500 cubic yard per day.

At the close of operations for 1931 the pouring of concrete had progressed far enough for the installation of outlet lines of high test iron, made according to a special formula, by the cupola process, by Stearns Rogers Co., of Denver. A feature of construction was the use, for the first time, of Chicago Automatic cone valves on the outlets. Two 30-inch valves were used on a 36-inch pipe through the dam and four 42-inch valves on two 60-inch outlet pipes. Temperature gages have been installed in the dam to indicate the temperature at all times.

PERSONNEL

E. M. Whipple was Construction Superintendent for the contractor in the early stages of construction, D. D. Gross is Chief Engineer of the Water Department, and George M. Bull is Consulting Engineer on the dam. S. T. Weller was at first Resident Engineer, later resigning to become Inspector for the State Engineer's office, and was succeeded by John Coley. Milton Ray is Superintendent of aggregate production.

The Thrill of the Chase at a Bidders' Matinee

A RECENT issue of *California Highways and Public Works* contains a description of the weekly colorful events in the routine of the Department of Public Works of California when bids are opened in the large board room on the third floor of the Department building at Sacramento. Two o'clock is the hour set for the important business of opening bids submitted on proposed work. Long before the hour, however, the room is filled with some seventy or more contractors, material men, bond company agents and others interested in the results of the bidding contest. They sit there chatting, chaffing, smoking, apparently a care-free lot but each one is secretly wondering if there is a "fox" in their midst.

At the department executive's table sits the principal assistant engineer, flanked by the staff engineer, assistant office engineer, assistant secretary of the Highway Division and disbursing officer.

When the principal assistant engineer announces the bids are about to be opened, a deep silence suddenly pervades the room. The assistant secretary of the Highway Division takes a large sealed envelope from a pile in front of him containing the bids, opens it, extracts the bid, and a fat cashier's or certified check representing a liberal 10 per cent of the bidder's figure. He announces the title of the job, the name of the bidder and the size of the check and passes the sheet to the staff engineer who reads aloud the item prices and total figure of the bid. The reading is followed with rapt attention while busy pencils jot down item prices and totals on blank forms for comparison with their own bids. So the silent quest for the "fox" goes on till the last bid is read and the lowest bidder is revealed. He is the man who has outfoxed them all in coralling the contract.

Instantly the silence is broken by a loud buzz of conversation and bustling about as rival bidders argue and bond house agents and material men besiege the "fox" for business. Some rivals congratulate him, others commiserate with him declaring he'll "lose his socks" on the job. Thus the "fox" is caught in the open and the hunt is over.

Conserving Steel Bridges

IN a paper by Henry A. Gardner of the Institute of Paint and Varnish Research, Washington, D. C., on "The Economics of Paint" some interesting facts are brought out regarding the cost of protecting steel bridges against corrosion. A ton of fabricated steel worth about $50.00 is effectively preserved by probably less than $3.00 worth of paint. One of the bridges spanning the East River in New York contains 60,000 tons of metal which has been protected with 500 tons of paint. This represents about 6 per cent of the value of the metal as the cost of the paint to protect such a great structure. These structures will not endure without paint.

A 114-Inch Liner Plate Tunnel Jacked Under Railroad

Spiniello Construction Company of Newark, N. J., Drove 110-Foot Tunnel Under the New Jersey Central Tracks

IN order to provide a passage for the 84-inch concrete sewer pipe crossing the four-track main line of the Central Railroad of New Jersey, the City of Plainfield awarded a contract for the driving of a liner plate tunnel 110 feet long.

The first operation was the excavation of a jacking pit 15 feet deep and 16 feet long by 14 feet wide next to the local Saurer plant of the International Motor Co. and just outside the railroad right of way. As soon as the pit was completed it was necessary to cut off the flow of ground water with well points. These were driven 25 feet deep with the tip of the well screen from 5 to 6 feet below the bottom of the excavation. Two-inch well points with 60-mesh screen were used with 1¼-inch risers delivering to a 4-inch header, which was on the suction side of a Marlo 6-inch self-priming centrifugal pump. The water was delivered to the completed section of the sewer which was to be continued through the tunnel. Nineteen 1¼-inch well points were driven along the sides of the jacking pit, forty-one 2-inch well points along the track on the north side and 35 on the south side with none between the tracks where they might have interfered with the operation of the railroad.

Surface Equipment

In addition to the centrifugal pump mentioned, there were several other pieces of auxiliary equipment for the operation of the job on the surface above the pit. These included an I-R 240-cubic foot air compressor which furnished air to operate the Watson-Stillman single-cylinder hydraulic pump which actuated the four Watson-Stillman jacks at the shield. A Union Iron Works grout machine was set up near the jacking pit to handle the grouting around the liner plate tunnel and between the pipe and the tunnel rings. An Austin tractor crane handled all the excavation for the jacking pit and the removal of the buckets of muck from the tunnel.

Driving the Tunnel

The liner plate tunnel was driven by four Watson-Stillman 125-ton double acting shield jacks of 34-inch stroke. These were placed in the jacking pit at the start of the work and five sections of Truscon liner plates set up with the jacks working against a wooden

The Well Points, Header and Pumps at the Jacking Pit

The Machine Which Placed Grout Around the Liner Plate Tunnel

backing. After the work had progressed so that the friction of the plates against the surrounding earth was sufficient to take the thrust of the shield, the backing was done away with and the thrust taken by the last four rings. There were nine full segments and one-half segment per ring. Each full segment weighed approximately 87 pounds and was 16 inches wide, 37 11/16 inches long and ⅜-inch thick. The flanges were 2 inches. There were three bolt holes on each end and four on each side for the ¾-inch bolts connecting the rings and segments. Ten per cent of the plates were tapped with 1½-inch threaded grout holes through which the 1:1 grout of cement and sand was forced around the outside of the tunnel. This was put in at a pressure of 80 pounds per square inch which was sufficient to force it in small jets up around the railroad ties above the tunnel in one instance, much to the surprise of the railroad maintenance of way crew.

The shield which had an outside diameter of 118 inches and measured 12 feet in length was built by Alco Products, Inc., New York. The inside diameter of the shield was 78¾ inches. A 24-inch industrial railway track was laid on stringers inside the tunnel for the carrying forward of liner plates and timber and for the removal of the buckets of muck. The heading was well lighted with 300-watt daylight electric bulbs and the remainder of the tunnel was lighted with the same size bulbs strung through the center at close intervals. The hydraulic line for the jacks was carried along the right-hand side of the tunnel at mid-height against the plates and consisted of 1-inch steel pipes with screwed connections. Under each rail were the 12 x 12-inch bents which were so framed, as shown in the illustration, that they did not interfere with the mucking operations. The grout line to the threaded grout holes was a 4-inch heavy-duty hose with connections for the 1½-inch lines.

The tunnel carries a Core Joint extra heavy concrete pipe 84 inches in diameter for the flow of sewage. This was carried into the tunnel in sections 4 feet in length and skidded in on a concrete cradle built to the true grade in advance. The pipe was grouted in with a 1:1:1¼ grout, using pea gravel for the coarse aggregate. This was designed to give a 4,000-pound concrete between the pipe and tunnel.

The contractor used eight men for the work in addition to the track operators. The tunnel crew consisted of a foreman who looked after the pumps and other more or less automatic equipment, two muckers, two men on the muck cars, a craneman, and two men setting plates. With this crew the contractor was able to install eight rings per 24-hour day.

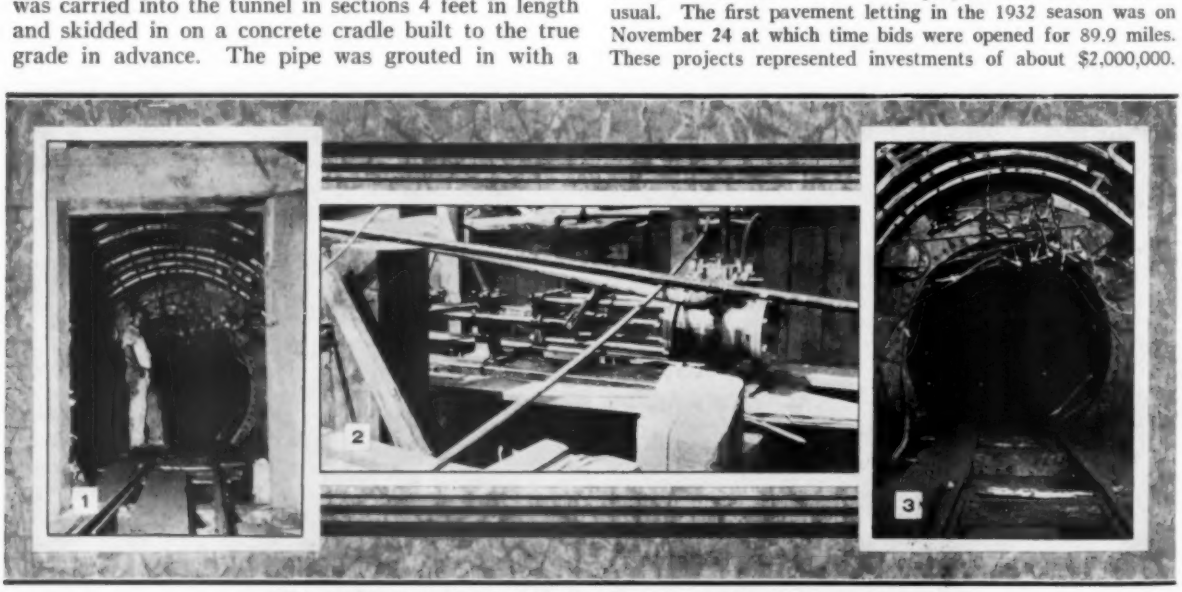
PERSONNEL

This tunnel was built by the Spiniello Construction Co., of Newark, N. J., under the direction of J. K. Stickle, Chief Engineer. The structural design was handled by A. W. Vars, City Engineer, Plainfield, N. J., for which city the structure was built. Weston Fuller was Consulting Engineer for the city on the design of the entire sewerage system. Upon the completion of the work the shield and hydraulic equipment were sold to the Weldon Contracting Co., Westfield, N. J., for driving a similar sewer tunnel under the Central tracks at Westfield.

Indiana Urges Contractors to Aid in Unemployment Relief

PAVING contractors on 1932 projects of the State Highway Commission of Indiana have been asked to limit their working schedules to 9 hours per day and not to exceed 54 hours per week in order to spread work among a larger labor personnel. The State Highway Commission action is in the form of a resolution aimed to aid the unemployed.

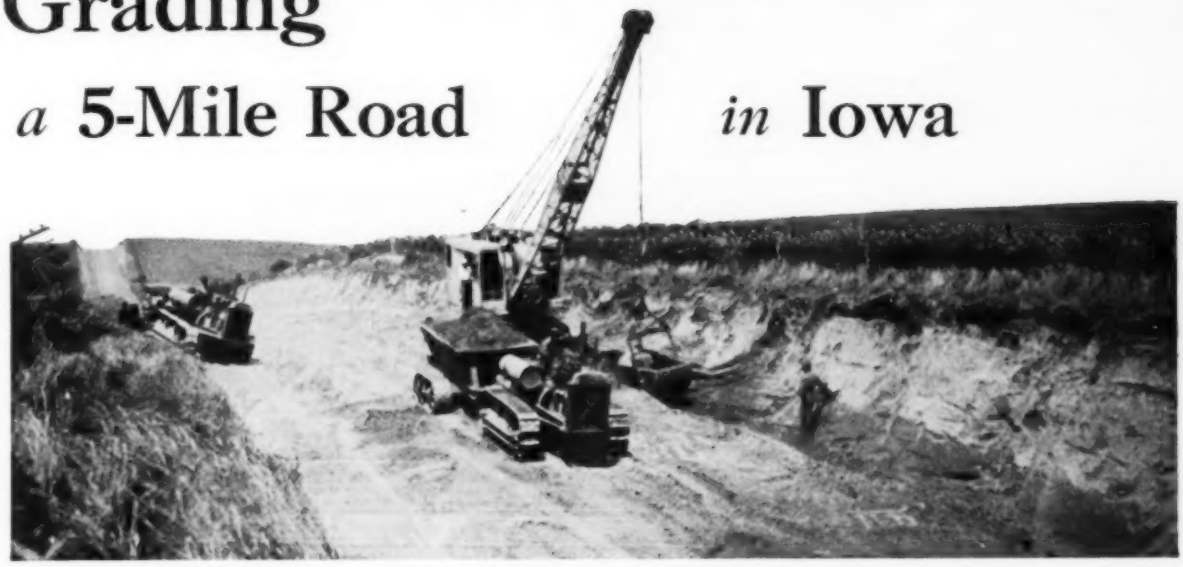
Contractors were urged to do as much work this winter as is reasonably possible without tearing up old roads and necessitating maintenance of expensive detours. While surface pavement can not be laid in freezing weather, rock excavation and culvert work can be done. In order that a greater volume of this type of work could be available this winter, the Commission contracted for its 1932 projects much earlier than usual. The first pavement letting in the 1932 season was on November 24 at which time bids were opened for 89.9 miles. These projects represented investments of about $2,000,000.



THE SHIELD, HYDRAULIC PUMP AND LINER PLATE RINGS

1. The shield seen through one of the 12 x 12 bents, one of which was erected beneath each railroad track. 2. The single-cylinder hydraulic pump which supplied power for the four shield jacks. 3. A close-up of the shield showing the four 125-ton hydraulic jacks and the control valves.

Grading *a* 5-Mile Road *in* Iowa



Clyde W. Drew Company of Omaha Moved 1,300 Yards a Day on a 100,000-Yard Job With 200,000 Station-Yards Overhaul

A GRADING job that the engineers reported as profitable for handling with an elevating grader outfit only was put through with all speed by the Clyde W. Drew Co., of Omaha, Neb., with a dragline. The reason for the use of the dragline instead of the elevating grader was that the first cut was narrow, and had already been cut in the first grading of the county trunk highway to such a depth that an elevating grader could not be used economically to start the work. It would have needed the dragline at its beginning, anyway.

Beginning on May 10, 1931, a Koehring dragline with a 35-foot boom and a 1¼-yard Drake-Williams bucket worked with three Caterpillar Sixties hauling Euclid 7-yard crawler wagons heaped to a full load of 8 cubic yards. The job extended through 5 miles of hilly country with seven large cuts. The cuts were worked both ways to the fills and the largest cut amounted to 20,000 cubic yards. The average of the seven cuts was about 15,000 cubic yards. The cuts averaged 15 feet in depth with a maximum at the north end of 25 feet. The job called for 500 feet free haul, but the overhaul on the entire job ran up to 200,000 station-yards, with a total of 100,000 yards of excavation.

The material to be moved was the typical mellow crumbling clay of that section. The road was graded with a 26-foot roadway and 4-foot ditches averaging 3 feet in depth. The banks were sloped ½ to 1, standing at that steep slope for long periods without washing.

In moving the material from the cuts to the fills the crawler wagons were heaped full by the dragline and then hauled down the slope and windrowed, starting from one side and working across to the other. The farthest load on any one section was dumped first, and then the tractor and wagon run over it on the next round, spreading the dirt as it went. Following the dumping of a series of loads in one windrow the Mormon team with a driver and board man spread the dirt to an approximate level grade before the second windrow was started. At the end the entire grade was smoothed up with a Caterpillar Hi-Way Patrol grader pulled by one of the tractors.

This job made an interesting study of the length of hours that are economical for a grading outfit to work. At the start two 8-hour shifts were worked as a means of relieving the labor situation. The men started to work at four in the morning and worked until noon. The second shift came on at noon and worked until eight in the evening. With the equipment double-shifted it was supposed that the dirt moved would mount rapidly. It was found, however, that only 1,000 yards was hauled in the sixteen-hour day. A careful analysis of the conditions showed that the men left any minor repairs to equipment for the next shift to handle, thus letting them run longer than they should and put-

The Mormon Team in Action

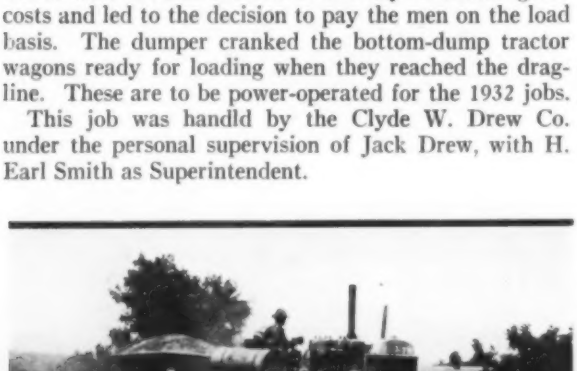
ting the burden of repairs on the next man, delaying his start.

The working hours were changed to one 12-hour shift with a material increase in the output of the crew. The dirt handled mounted from 1,000 yards to 1,300 yards almost at once. They felt the responsibility for the care of the equipment and the more experienced operators were used which made some difference in output. A further change was planned for the next job on which the same men and equipment were to be used by paying the men on the tractors at a load rate. It was felt that they would be more careful in handling the tractors and wagons and in spotting them at the dragline so that they would get in more loads per day.

The grading crew for the 12-hour shift consisted of: three tractor operators, one dragline operator, one oiler, one dump man, one driver for the Mormon team, one Mormon man, one timekeeper, and a foreman. When the outfit was moving from one job to the next the dragline picked up the Euclid crawler wagons and put them on the cars and unloaded them at the end of the trip.

As organized, the three tractor-wagon units were hauling 200 loads a day. Each tractor man received a ticket from the dump man for each load brought to the dump. These were used at the end of the day in checking the costs and led to the decision to pay the men on the load basis. The dumper cranked the bottom-dump tractor wagons ready for loading when they reached the dragline. These are to be power-operated for the 1932 jobs.

This job was handld by the Clyde W. Drew Co. under the personal supervision of Jack Drew, with H. Earl Smith as Superintendent.



A Sixty Tractor and Euclid 8-yard Crawler Wagon Approaching the Dump

Portable Lights Solved Problem of Night Work and Excessive Dust

THE middle of last summer the Lex Construction Co., Milwaukee, Wis., was awarded a contract for the approach for an overhead railroad bridge on a new highway 6 miles north of Manitowoc, Wis. The State Highway Commission had decided that rather than go to the expense of depressing the railroad tracks at this point, it would build the overhead bridge.

The overhead bridge is approximately 30 feet above the track level on a super highway. The materials used in making the fill had to be hauled for a distance of 3 miles over unimproved, unlighted roads. Toward the middle of August, it was decided in order to complete the job in the specified time that it would be necessary to add a night crew. Inasmuch as the district was without illumination the question of lighting the roadway for the trucks and lighting the job and the shovels was a serious matter. It would be necessary to string an electric power line approximately 6 miles or use portable electric equipment or carbide lights.

A group of eighteen National Carbide VG lights and five VG Handy lights and one acetylene lantern were installed. The lights were set at intervals from the point where the shovels were working to the fill, giving adequate light for the movement of the trucks, none of which were equipped with head lights. Because of the unevenness of the ground and the vibration caused by the movement of the truck and tractors back and forth along the road, the lights were tipped over many times but the only attention necessary was to set them upright again and they continued to operate.

Due to the drought during the summer, the air was filled with heavy dust which caused a thick cloud the length of the job all of the time. This affected the burners slightly but was soon corrected. Additional illumination as far as area was concerned was secured by mounting the lights on empty oil drums which gave a greater spread for each individual light.

Two of the Handy lights were mounted on each shovel platform and one Porto light on the platform with the reflector mounted out on the boom, throwing the light directly on the work. Through the use of this type of lighting, the contractor was able to complete the operations in the specified time and the lights have since been used on several other jobs.

1931 a Big Construction Year in Minnesota

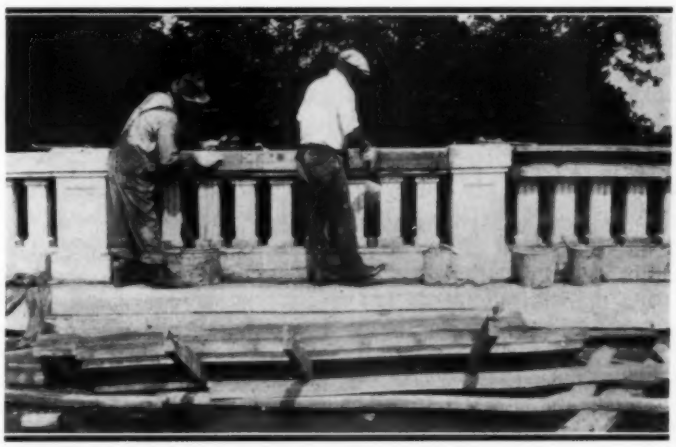
THE Minnesota Highway Department during 1931 completed the largest construction program in its history and the program for 1932 is almost equal to the 1931 accomplishment. The construction completed during 1931 included 435 miles of concrete paving, 722 miles of grading, 812 miles of new bituminous gravel treatment, 486 miles of gravel surfacing and 106 bridges totaling 10,886 linear feet.

The program for 1932 includes about 430 miles of paving, 500 miles of grading, 1,000 miles of bituminous gravel treatment, 400 miles of gravel surfacing and approximately the same amount of bridge construction as in 1931.

Bids on sixteen paving projects, opened at the offices of the Minnesota State Highway Department on December 22, 1931, were rejected and the projects readvertised in the hope of getting more favorable prices, according to an announcement from Commissioner Babcock. The projects totaled 210 miles and constituted about half of the 1932 program. Commissioner Babcock said, "Prices on paving and other road work were lower in 1931 than in any year since the state began road building. Indications are that 1931 was the low spot in the depression, and we expected to pay slightly higher prices in 1932, but bids on nearly all of the projects were considerably higher than our estimates, so it was decided to reject all bids."

It would seem that contractors in Minnesota are awakening to the fact that they have been bidding unusually low prices and that to continue in business, prices must be better.

Winter Concreting *on a* 180-Foot Bridge



Finishing the Hand Rail in Early Summer

ON September 28, 1930, the construction organization started work on the concrete and structural steel bridge which divided the paving contract of the State Construction Co. on Michigan State Route 9 south of Dimondale. The bridge has three spans of 60 feet each supported on two piers of reinforced concrete column and girder design, having three concrete columns to each pier, these being supported on individual spread footings of reinforced concrete and having two abutments of reinforced concrete counterfort and buttress design. The structure is of steel deck girder design and is built on a 60-degree skew with a roadway width of 40 feet between curbs. The curbs are of reinforced concrete with a height of 10 inches and having a width of 18 inches from the concrete railing to the edge of the curb to provide safety walks and pedestals.

The first operation was the driving of the 2 x 12-inch Wakefield wood sheet piling with square edges and measuring up to 25-foot lengths. The timber was driven down to 15 feet below the bed of the stream to a firm foundation and then the cofferdam excavated with a Northwest gas crane with a 45-foot boom and a Blaw-Knox ¾-yard bucket. The material was cast on the bank and then used for backfill later. The excavated material was sand, hard clay and soft sandstone with a small amount of gravel. In the excavation of the wing walls most of the material was the local soft sand rock. This was removed entirely by chisel bars and hand work, there being no blasting permitted because of the danger of disturbing the rock below the footings. Two men were used for the rock excavation in each caisson.

Forms for the footings were set up in the cofferdams measuring 6 x 8 feet for each of the six center piers. Hooked bar reinforcing was used with fifteen 1¼-inch bars for each caisson and three caissons for each pier. Concrete for the footings as well as the remainder of the structure was mixed in a Ransome 14-S mixer set up on the north bank of the stream. Grade A concrete was used throughout the structure although some Grade B concrete was originally specified. The Grade A concrete on this job was approximately a 1:2½:4 mix designed to fit the particular material used on this job and was mixed in 3-bag batches. The aggregates were carefully measured in wheelbarrows and the individual batches weighed on a wheelbarrow scale made by the Wheelbarrow Scale Co. of Chicago Heights, Ill.

All concrete for the entire structure was buggied across a runway from the north bank at the elevation of the completed top slab of the bridge. The runway was built up of 2 x 6-inch lumber planked on top. Water for the concrete was furnished by a Morris 4 x 6-inch jet pump which delivered the water to a 10-barrel steel tank located about 20 feet from the mixer and some 5 feet above it. The other water problem, the unwatering of the cofferdams, was handled by a Domestic 6-inch self-priming centrifugal pump. Other equipment of special interest included a saw table which was used to cut all the form work for the entire bridge. It was made by Beach, Brown & Co. of Montrose, Pa., and was powered by a LeRoi 2-cylinder gas engine. For handling the work under the bridge slab after the concrete had been poured, including the finishing of the sixty concrete diaphragms between the thirty-three 60-foot I beams each 36 inches deep and the painting of the I beams, the contractor built a float of eight oil drums and erected a scaffolding on it for the workmen.

Work Continued Through Most of Winter

Most of the concrete was placed during the winter so that ample provision had to be made for severe weather. It happened that the winter was relatively mild but the temperatures were well below safe concreting figures and the structure was completely housed with a wood frame and canvas so placed as to allow ample room for stripping the forms and finishing the concrete inside the housing. The specifications required

curing by wet steam and that the temperature within the housing be at least 60 degrees Fahrenheit during the first three days, at least 50 degrees Fahrenheit during the next four days of curing and at least 40 degrees Fahrenheit during the following seven days. A shorter curing period was allowed if test beams showed sufficient strength in less than the required fourteen days of curing. The interior was heated with a 60-horsepower steam boiler from which pipes were also led to the stockpiles and grids of 1¼-inch pipe laid beneath each pile of aggregate. The water was heated by waste steam led directly into the tank. Because of the mild character of the winter it was possible to continue the work right through. About four weeks were taken out because of the condition of the work and the need of waiting for the curing of the concrete before more work could be done. These weeks were in February and March.

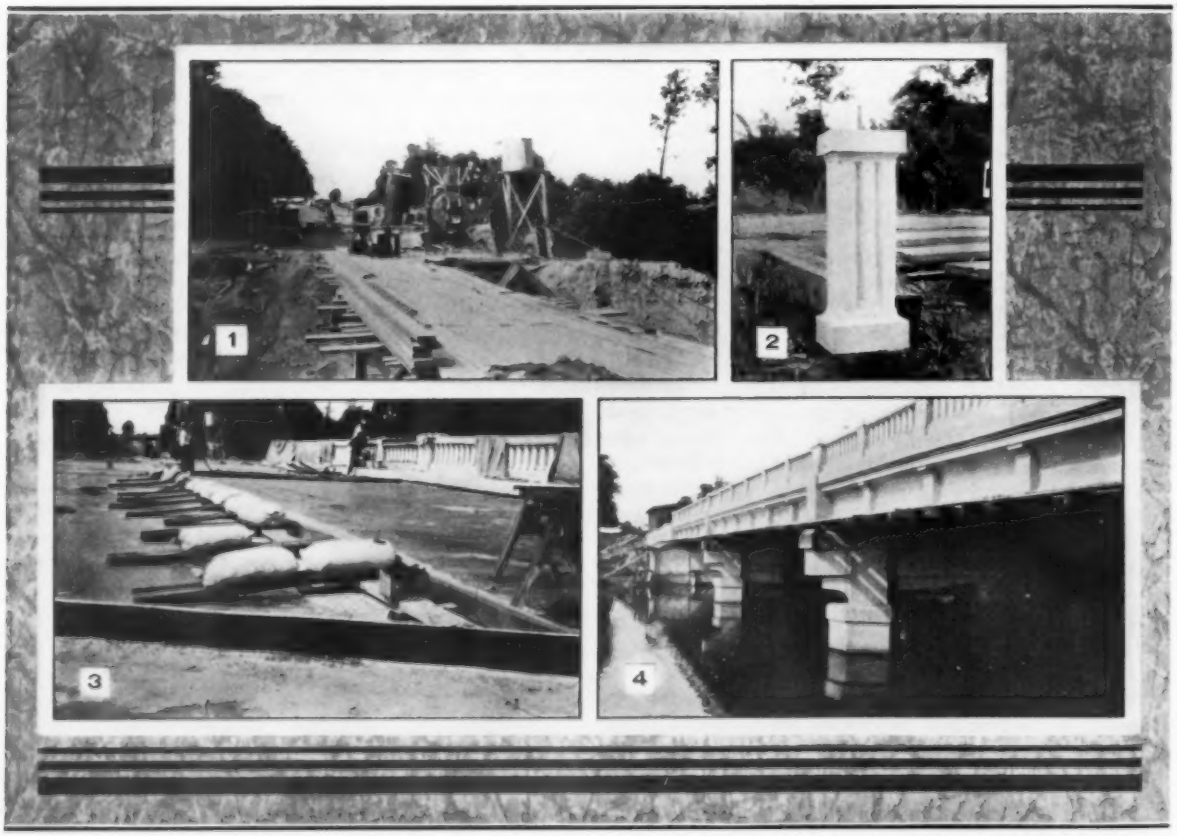
During the winter the 324 separate concrete spindles for the railings were cast in the housing of the main structure where they could be cured without danger of freezing. These were made up with standard steel forms according to State specifications with one form for each side and the four held firmly with clamps top and bottom. They were tapped during the pouring to insure a good grout against the forms. The results were very good as the spindles required the minimum of rubbing and hand work when they were finally in place in the parapet. The spindles were cast with a ½-inch round rod through the center for ease of handling and to insure a firm bond between the hand rails and bottom rails. The pilasters were first cast in place and then the spindles set and the top and bottom rails cast to give a practically monolithic parapet. These were finished by hand rubbing with carborundum brick and water. All concrete surfaces on the substructure and superstructure which were exposed to view after completion of the approach grading were similarly hand finished.

Only the substructure of this bridge and the individual spindles were cast during winter weather. All work on the superstructure was done in the late spring and summer.

WATERPROOFING THE SLAB AND POURING THE WEARING SURFACE

The top of the main bridge slab was waterproofed with a liquid coating cut-back asphalt in two coats poured on and broomed around to completely cover the slab. On this was poured the wearing surface of paving concrete with a 6 x 6-inch welded steel fabric reinforcing mat set in the middle of the 6-inch slab. This wearing surface was poured in two days, three sections each

(Continued on page 60)



FINISHING UP THE CONCRETE AND STRUCTURAL STEEL BRIDGE SOUTH OF DIMONDALE, MICH.

1. The water tank, boiler, concrete mixer, saw rig and other accessories at the north end of the bridge. In the foreground is the runway of 2 x 6-inch lumber. 2. One of the concrete spindles. 3. Forms set up and held in place by pieces of steel sheet piling and weighted with cement bags. 4. A view beneath the bridge from the south end, showing the piers.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

You Must Not Believe Everything You Are Told

It may be that an asphalt salesman was a bit too zealous in getting an order, and orally stated to the buyer that equally satisfactory asphalt could not be obtained for less. Even so, the Louisiana Supreme Court decided, in an opinion handed down July 1, 1930 (129 So. 678), that the buyer company could not complain, because it knew, or ought to have known, just what the situation was. In other words, no one can rely on what comes in through his ears, when his eyes contradict it. The decision seems, also, to have been influenced by the fact that the order contained a recital that no understanding existed between the parties, excepting as expressed in the writing. The court said:

"He [the buyer's president] was therefore in a position to know, and did know, that no price could be made to him except subject to the approval of defendant's sales manager; that other and equally satisfactory asphalt could be obtained at a lower price than that at which defendant was offering its own product; and, if the price at which defendant was offering the asphalt was not satisfactory to him, he had only to refuse to purchase from defendant and purchase from the other company. 'Where the purchaser has the means of finding out for himself the qualities (or value) of the thing sold, he cannot complain of any alleged misrepresentation by the vendor.'"

State Highway Department Upheld in Extending Construction Without New Bids

Although the courts are apt to scrutinize very closely any transaction in which public contracts are awarded without competitive bidding, the Oklahoma Supreme Court takes the position in the recent case of Leininger v. Ward-Beekman & Brooks, 282 Pac. 467, that it does not follow that a state highway department is utterly without power to extend a contract already made so as to cover additional construction at the same unit prices. Said the court:

"To require bids for the construction of a small extension would be to subject the state to excessive cost by reason of the small amount involved. It would doubtless be for the financial benefit of the state to have the additional work done at the unit price already agreed upon. On the other hand, the work covered by the original contract might be so small as to result in an increased contract price therefor, and an extension of that contract to include additional work would result in a price being paid for the additional work in excess of what would have been necessary had bids therefor been required.

"When a unit price has been agreed upon after notice and competitive bids, it is, in our opinion, within the discretion of the state highway commission to make reasonable extensions to cover construction work not embraced within the terms of the contract, but which is a continuation of the work contracted, and, in the absence of a showing of fraud, or abuse of discretion or collusion therein, the discretion of the state highway commission will not be controlled by this court."

"Near" Contracts Are Far from Being Contracts

The devotee to malt drinks may be able to get a semblance of "kick" out of "near beer," but no contractor can possibly get a "kick" out of a "near contract," unless it be the kick that a defeated litigant gets when he is boosted out of court.

A near contract is a "delusion and a snare." There is no more substance to it than will be found on the inside of a toy balloon.

Even though the subject matter of agreement may be of such nature that a written contract is not legally necessary—as is almost universally true of construction contracts—the parties may, of course, mutually agree that their contract shall not be effective until and unless reduced to writing and signed.

Very often it becomes difficult for a court to say whether or not a verbal agreement became binding where a contemplated writing embodying the terms was never drawn up. How such transactions are generally viewed by the courts was thus stated by the Maine Supreme Judicial Court in the case of Mississippi Steamship Co. v. Swift, 86 Maine Reports, 248:

"If the written draft is viewed by the parties merely as a convenient memorial or record of their previous contract, its absence does not affect the binding force of the contract. If, however, it is viewed as the consummation of the negotiation, there is no contract until the written draft is finally signed. In determining which view is entertained in any particular case, several circumstances may be helpful, as whether the contract is of that class usually found to be in writing, whether it is of such nature as to need a formal writing for its full expression, whether it has few or many details, whether the amount involved is large or small, whether it is a common or unusual contract, whether the negotiations themselves indicate that a written contract is contemplated as the final conclusion of the negotiations. If a written draft is proposed, suggested, or referred to during the negotiations, it is some evidence that the parties intended it to be the final closing of the contract."

Acceptance of Service Implies Promise to Pay Reasonable Price

"Please let me have your check for $129.81, your share of the price of the surveys of steel construction on that school building on which you bid," requested a New Orleans engineer.

"But I never had any arrangement with you to furnish me copies," replied the contractor. "If, as you say, you called up my office and my secretary said that we wanted a set, I haven't the slightest recollection of it."

The engineer sued for the amount claimed by him and the Louisiana Court of Appeal upheld an award in his favor. (Stubner v. Raymond, 135 So. 676.) Referring to the fact that the defendant retained the copies furnished by plaintiff, the court said:

"If he had any doubt as to the terms under which the plans were supplied him, he should have inquired. Not having done so and having accepted the plans, he should pay the customary price."

Who's Who in Construction

A Series of Reports from Active Contractors

BUS. VOLUME—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $500,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

H. W. Underhill, Pres.

The H. W. Underhill Construction Co., Wichita, Kans., 235 N. Waco Ave. Organized: 1921. Bus. vol B. Branch offices: Oklahoma City, Okla., Dallas, Texas and Amarillo, Texas. Officers: H. W. Underhill, President; F. Barneyback, Secretary-Treasurer; J. J. Bollinger, C. E. Stemmons and R. S. Barneyback, Vice Presidents. Major contracts: 1927, Herring Hotel, Amarillo, $1,200,000; 1931, United States Post Office, Wichita, $260,000, University buildings, Jefferson City, Mo., $250,000. This company has executed 219 contracts aggregating $10,000,000. Member: A. G. C. of A.

Frank P. Gandy & Son, Inc., Atlantic City, N. J. Organized: 1926. Bus. vol. E. Branch offices: Margate City and Wildwood, N. J. This company was first known by the name of Vansant & Gandy, formed about 1908 and dissolved in 1915. The company was then reorganized under the name of Frank P. Gandy for about three years when it was changed to Frank P. Gandy & Son, Partnership. In 1926, the company was incorporated under the New Jersey laws. Officers: Frank P. Gandy, President; Lottie M. Gandy, Vice President; Francis E. Gandy, Secretary and Treasurer. Major contracts: 1928, Borough of Longport; 1929, City of Ventnor, City of Wildwood; 1930, City of Atlantic City, Betty Bacharach home, Longport, New Jersey Bell Telephone Co., F. P. Woll, Longport, J. T. Langhorne, Mary B. Roberts, Standard Engineering & Construction Co.; 1931, C. F. Leng, New York City. Member: Chamber of Commerce, Atlantic City, N. J.

A. C. Campbell, Winnfield, La. Organized: 1923. Bus. vol. C. This company was first organized to make concrete pipe and to build sidewalks, curbs and gutters. In 1925, they began to subcontract small culverts and bridges. In 1927 extended to building of gravel roads and larger bridges. Major contracts: 1929, Calcasieu River bridge, approximately 2,200 feet long, 15 miles of dragline embankment; 1930, 26 miles of concrete highways; 1931, 34 miles of concrete highway.

The James C. F. Shafer Co., Cleveland, Ohio, 1001 Huron Rd. Organized: 1924. Bus. vol. C. This company was first organized in April, 1922, by James C. F. Shafer as an individual concern and in December, 1924, was incorporated by himself and his associate. Officers: James C. F. Shafer, President-Treasurer; Martin F. McQuilken, Secretary. Major contracts: 1928, Shelby Power Plant, Glidden Company office building; 1929, Equipment Division of the G. E. office building; 1930, Galion power plant, Cowan Potteries, Inc., factory. Member: Cleveland Builders Exchange, Cleveland Building Trades Employers Association, Cleveland Chamber of Commerce.

Atlantic Bridge Co., Inc., Greensboro, N. C., United Bank Bldg. Organized: 1919. Bus. vol. C. This company was organized under the laws of the State of North Carolina and was primarily engaged in the construction of all types of bridges. Since January, 1920, they have completed contracts for various states in the South amounting to over $8,250,000. Officers: W. A. Crabtree, President; Ralph P. Coble, Vice President & Treasurer; J. E. Goodwin, Secretary. Major contracts: 1928, Lake Pontchartrain Bridge, New Orleans, La., Norfolk-Portsmouth Bridge, Norfolk, Va., Pasquotank River Bridge, Elizabeth City, N. C. Member: State and National Chamber of Commerce, Associated General Contractors, Tennessee Road Builders Assn., West Virginia Road Builders Assn.

L. H. Focht & Son, Inc., Reading, Pa., 529 Court St. Organized: 1919: Bus. vol. C. This business was started by L. H. Focht in 1871 and in 1890 became known as L. H. Focht & Son when the elder Focht took his son into the business with him. The partnership continued until April 1919 when a corporation known as L. H. Focht & Son, Inc., was organized and succeeded the partnership. Officers: G. W. Focht, President; William J. Senner, Vice President and General Manager; George S. Fisher, Secretary and Treasurer. Major contracts: 1928, concrete bridge for the City of Reading in Maidencreek Dam area, $120,000; 5-story concrete ramp garage for Marlboro Garage Co. in Reading, Pa., $300,000; 1929, new Tarvia-Lithic plant for The Barrett Co., Monocacy, Pa., $62,000, silk mill for Vanity Fair Silk Mills, New Holland, Pa., $55,500, Albright College, women's dormitory and dining hall, at Reading, Pa., $85,000, Grace Evangelical Lutheran Church, Shillington, Pa., $82,000, apartment and stores in West Reading, Pa., $65,000, new building for Historical Society of Berks Co., in Reading, Pa., $80,000; 1930, Berks County prison group, Bern Township, Berks County, $475,000, apartment and store building in Reading, Pa., $40,000, Tarvia-Lithic plant for The Barrett Co., Cheektowago, N. Y., $57,000, buildings for the Standard Oil Co., of Pa., at Tuckerton, Pa., $68,000, alteration work for The Carpenter Steel Co., Reading, Pa., $50,000. In addition to the above contracts, this firm has enjoyed the patronage of many clients who award their work on a cost-plus basis, the annual volume of which, not including any of the jobs listed separately above, runs well over $200,000. Member: Contractors & Builders Exchange, Reading, Pa.

Thomas H. Maxwell

Amsterdam Building Co., Inc., New York City, 110 East 42nd St. Organized: 1904, incorporated in New York State, 1905. Bus. vol. B. Officers: Thomas H. Maxwell, President, Lawrence A. Lenoir, Secretary and Treasurer. Major contracts: 1930, Salvation Army headquarters, New York City, $2,500,000; 1930-31, City Hall Building, Schenectady, N. Y., $1,500,000; 1930-31, Rensselaer Polytechnic Institute, Troy, N. Y., college buildings and two dormitories, $1,300,000. Member: Building Trades Employers Association.

Heavy Traffic *vs.* Underpass Construction

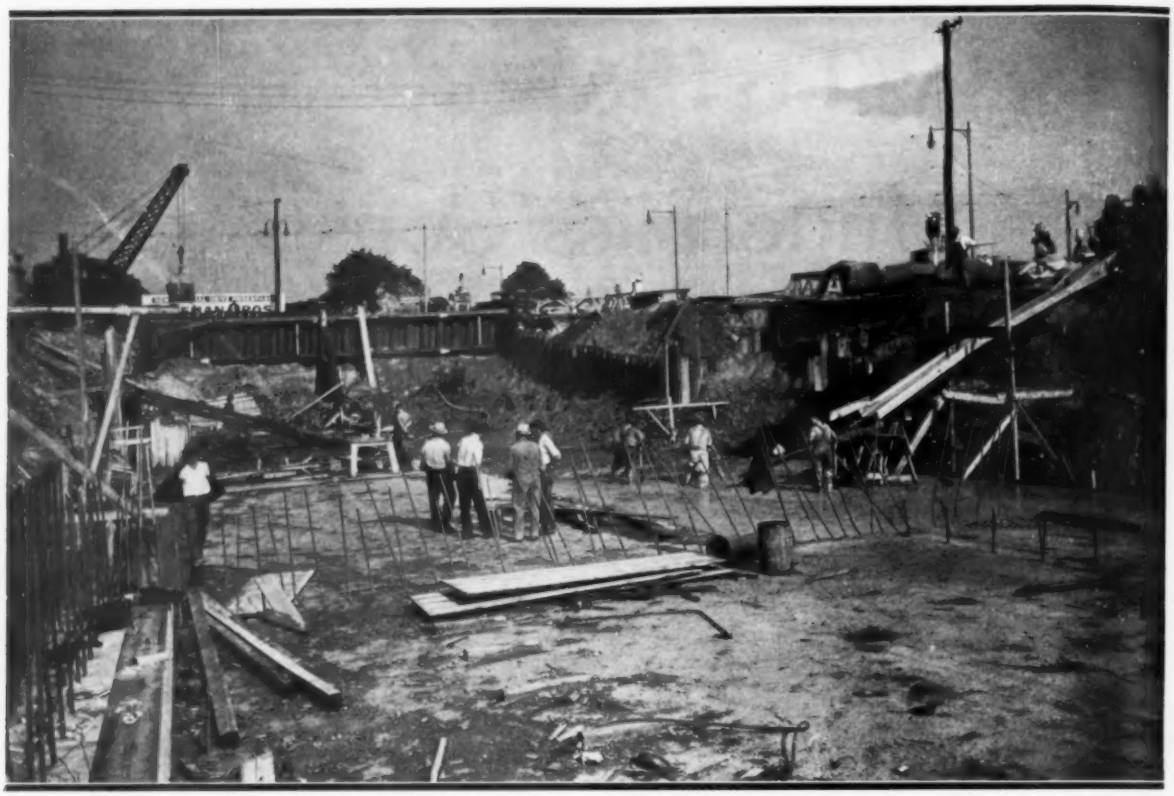
The Junction of Massachusetts Avenue and Memorial Drive Before Work on the Underpass Was Started. Massachusetts Avenue Runs from Left to Right Across the Picture with Harvard Bridge Crossing the Charles River at the Extreme Right.

Coleman Bros., Inc., Boston Contractor, Solved Series of Problems at North End of Harvard Bridge Linking Cambridge and Boston

THE Charles River in its lower stretches is known as the Charles River Basin and is the boundary between Cambridge and Boston. Several bridges span this basin, thus concentrating inter-city traffic. One of the oldest of these, Harvard Bridge, carries particularly heavy truck traffic and a double track trolley line of the Boston Elevated Railway between the industrial communities to the south and the large commuting and residential area to the north and west. Massachusetts Avenue, which runs across the bridge, is intersected at the north end of the bridge by Memorial Drive, a very heavily traveled thoroughfare from which commercial vehicles are excluded. The intersection has proved an increasingly serious traffic problem for a number of years.

During the 1931 construction season a contract was awarded by the Metropolitan District Commission to Coleman Bros., Inc., Boston, Mass., for the construction of an underpass which would carry Memorial Drive under Massachusetts Avenue, at a cost of $176,071.71. The structure consists of a reinforced concrete underpass and incline 640 feet long faced with granite. The construction included a pump room and sump pit, vitrified clay and reinforced concrete pipes for surface drainage, catch basins, manholes, Boston pattern fence with granite piers around the open incline, a granite block pavement with cement concrete sidewalk and granite edgestone on Massachusetts Avenue over the underpass, with a bituminous penetration macadam pavement over the drain trenches across the southerly roadway of Memorial Drive.

The contract provided for the construction to be carried on in two operations. The westerly half up to 13 feet easterly of the center line of Massachusetts Avenue was constructed first. During this operation the street railway tracks were relaid upon the easterly roadway of Massachusetts Avenue and a temporary bituminous macadam roadway 30 feet wide was constructed easterly of the street car tracks. Upon the completion of the westerly side and the opening of Massachusetts Avenue on that side to vehicles and street car traffic, the construction of the easterly side was undertaken. This ingenious scheme of operation, devised by E. H. Rogers, Director of Park Engineering of the Metropolitan District Commission, resulted in a large saving in the construction as it allowed all the excavation to be done by the open cut method and saved the cost of bridging the street surface and maintaining a street railway track.



Excavation Partially Completed Showing the Steel Sheet Piling in Place, the Footing Wall at the Left and the Pouring of the Foundation Slab at the Right

THE START OF EXCAVATION

Excavation for the underpass was started on July 20, 1931, with a ⅝-yard Erie steam shovel and a fleet of five Autocars and Mack trucks. The top dressing of loam from the parking area was hauled about 1½ miles to storage near the new Cottage Farm Bridge and the earth excavation was hauled to the West Boston Bridge about 2 miles in the opposite direction. In addition to the pitman for the shovel, there were about six hand laborers grading with shovels. Three days were devoted to loam excavation and on July 30, earth excavation was started. A Byers Bear Cat trench digger with four men and a foreman were used to dig the trenches for the drains. Most of this area was filled some 15 years ago by dredging from the bed of the Charles River with hydraulic equipment and filling behind a stone retaining wall. During excavation for this underpass, numerous clamshells were dug up on the east side and practically all gravel on the west side of the underpass.

On August 3 the construction of a temporary road was started on the east side of Massachusetts Avenue which would permit the maximum depth of excavation for the underpass without maintenance of an overhead roadway. First the granite edgestone was removed and then the loam removed so that Massachusetts Avenue could be detoured north and south around the excavation. To take care of this detour, the northeast corner of Harvard Bridge had to be temporarily widened 4 to 5 feet and temporary car tracks laid in the roadway.

As soon as excavation had progressed sufficiently, 15 to 25-foot lengths of Bethlehem steel piling with 16-inch web was driven by two Erie steam cranes with long booms using McKiernan-Terry steam pile hammers. The use of the steel sheet piling made cross bracing unnecessary.

CAISSON CONSTRUCTION

Caisson work was done by subcontract by The Gow Co., Inc., of Boston, which started work on August 5 and excavated the 105 caissons down to good gravel. The caissons were divided into three groups, A, B and C, on the north, center and south of the work respectively. The north group ran from 5 to 15 feet below grade with one running to 20 feet. The center group averaged 10 feet and the south group from 7 to 15 feet. The work progressed rapidly with one man in each caisson handling the excavation and loading to a small bucket which was hauled up by tackle from a tripod mounted above.

FOOTING WALLS

In concreting the footing walls the batches of aggregate were hauled in the general contractor's own 4-batch trucks a distance of about a mile from the Boston Sand & Gravel Co. plant at the West Boston Bridge, Kendall Square, Cambridge.

The batches were mixed in a Foote 1-yard mixer and in a 1-bag mixer. One man dumped the trucks and there were two mixer men. In placing the concrete, the boom and bucket of the Foote machine were re-

moved and the concrete was delivered direct to the forms by coal chutes. There were four men in the concrete gang, three handling the Dragon cement and one who emptied the paper bags of cement into the skip.

Five-foot foundation walls were poured in place of caissons under Massachusetts Avenue where the street railway tracks and heavy traffic were concentrated. The foundation walls were 120 feet long and 2½ feet wide with a 4-foot toe. The caisson construction was used all the way through on the north and south lines but the middle line used the continuous foundation wall construction.

A girder varying from 18 x 28 inches to 18 x 24 inches was poured on top of the center line of caissons continuous from end to end of the job, a total of 636 feet. This was fully reinforced and was poured with the small mixer, using eight men in the concrete gang.

At the same time that the foundation wall was poured, 4 and 6-inch mat was poured the full width of the underpass and crowned ¼-inch to the foot as a protection for the fabric waterproofing which was laid 2-ply and 3-ply on top of the mat. Both fabric and asphalt were furnished by Philip Carey Co. On the fabric waterproofing the reinforced concrete invert slab of the underpass was poured 12 to 17 inches thick with a construction joint for the 19-inch main side wall.

Novelty in Form Work and Bracing for Walls

After the invert was poured, the granite facings for the main side walls were erected and used as the front form for the side wall. The facing was first class granite from the Woodbury Granite Co., Hardwick, Vt. Anchors grouted into the granite securely held the walls to the concrete. The side walls had a maximum height of 12 feet 8 inches and a minimum of 5 inches. The granite facing was composed of slabs sawed to 4-inch thickness. On the back of the side walls was placed a 2 and 3-ply waterproofing with a 6-inch skin wall on the outside. All form lumber was 1-inch rough board with 3 x 4-inch facing.

A novelty in bracing was used on this job. When the invert or roadway foundation slab was being poured 4 x 4-inch wood blocks were set in the concrete when soft and the 3 x 4-inch braces for the granite facing of the side walls were set up at an angle of 45 degrees at varying distances from the wall against these wood blocks. The blocks were later chipped out and the spaces filled with concrete.

Drainage System

The drainage system was installed below the concrete mat and prior to its pouring. It consists chiefly of vitrified clay pipe. The pipe drains to a sump where two Gould sump pumps are installed. The contract requires two sources of electricity for the pumps, alternating current from the Cambridge Electric Light Co., Cambridge, Mass., and direct current from the Boston Elevated Railway Co., so that power will always be available even if one source is temporarily out of commission because of a storm. The pumps are set to start automatically at different elevations of water in the sump and each delivers 600 gallons per minute against a 20-foot head.

When the excavation intersected an old 21 x 21-inch wood drain about 215 feet long which drained Massachusetts Avenue from a manhole on the Cambridge side,

Pouring the Deck Slab and Preparing Forms for the Side Walls of the Approaches, Using the 4-inch Granite Slabs as One Side of the Form

this drain was replaced with a 30-inch reinforced concrete pipe about double the length of the original drain which carries the water around the underpass.

KEEPING THE JOB DRY

Drainage during construction was reduced to a minimum because there was so much clay in the river bank that the job was practically tight. The contractor encountered less water than was expected although there was some marsh gas liberated which necessitated the use of blowers twice during the work.

The Gow Co. used one pump in each hole while putting down the caissons and this seemed to dry out the surrounding land quite thoroughly. Dry weather during the entire period of construction following the completion of the caissons reduced the amount of pumping to a minimum. Only two Domestic centrifugal pumps used intermittently were required by the general contractor. As evidence of the lack of moisture in the ground, one of the shovels was run into the excavation below river level without miring, but the contractor was not willing to take any chances so the shovel worked from timber platforms.

PAVING

Granite block paving was used throughout the entire length of the underpass as its slightly roughened surface eliminates danger of skidding. Granite blocks 6 to 12 inches long, 3½ to 4½ inches wide and 4 to 4½ inches deep, were set on a 1-inch cushion of 1:4 dry mix cement and sand. The joints were filled with 1:1 grout. Sawed granite edgestone was set in four lines before paving was started, thus forming two 21-foot roadways with a 3-foot island in the center and an 18-inch sidewalk on either side, giving a 48-foot clear span over the two roadways. The Massachusetts Avenue roadway over the depressed section is 81 feet wide with an 11-foot 2½-inch sidewalk on either side.

OVERHEAD TRAFFIC CARRIED BY I-BEAMS

The heavy traffic using Massachusetts Avenue is carried by four 33-inch 260-pound I-beams mounted under the street railway tracks and by sixteen 30-inch 200-pound I-beams each 51 feet 6 inches long encased in concrete with no center support and having a clear span of 48 feet from granite to granite.

The West Approach Showing the Completed Walls and the Center Edgestone and Granite Block Paving in Place

SAFETY FENCE WITH CONTINUOUS STEEL CASING

As there will be much fast traffic over the top of the underpass and on either side of it, it was felt necessary to protect the depressed section against the possibility of cars falling into it. The Boston pattern fence used generally throughout the work of the Metropolitan District Commission has top and bottom rails of pipe 3 inches inside diameter with rods between. To increase the resistance of this type of fence to shock a ⅞-inch galvanized steel cable was run through the top of the fence and anchored at four places.

QUANTITIES

	Item	Unit Price
400	cubic yards loam excavated and placed	$ .70
14,000	cubic yards earth excavated	2.00
10	cubic yards ledge excavated	10.00
1,180	linear feet concrete caissons	6.00
50	cubic yards gravel borrow	1.00
955	cubic yards plain concrete masonry 1:2:3½	15.00
3,125	cubic yards reinforced concrete 1:2:3½ without reinforcing	13.00
460,000	pounds steel reinforcing	.04
3,800	square feet wire cloth	.10
214,000	pounds structural steel	.025
17,000	square yards membrane asphalt fabric waterproofing	.40
9,900	square feet 4-inch granite facing	11.00
370	square feet 8-inch granite facing	2.25
1,135	feet granite wall coping	8.00
20	granite posts 2 feet 6 inches x 3 feet 3 inches	90.00 each
4	granite posts 3 feet x 3 feet 6 inches x 3 feet	90.00 each
4	granite posts 3 feet 6 inches x 3 feet 6 inches x 3 feet	90.00 each
20	caps for granite posts 2 feet 8 inches x 3 feet 2 inches x 9 inches	24.00 each
4	caps for granite posts 3 feet 2 inches x 3 feet 8 inches x 9 inches	24.00 each
4	caps for granite posts 3 feet 8 inches x 3 feet 8 inches x 9 inches	24.00 each
2,670	linear feet sawed granite edgestone	2.80
240	linear feet straight granite edgestone	1.65
125	feet curved granite edgestone	2.20
315	feet granite edgestone removed and reset	.40
3,500	square yards granite block pavement	3.50
50	cubic yards cement grout	13.00
150	tons broken stone for bituminous penetration macadam	1.80
1,200	gallons bituminous material	.07
4	brick catch basins	60.00
2	brick drain manholes	75.00
16	cast iron junction boxes for electric power cables	10.00
6	cast iron junction boxes for lighting cables	6.00
11	steel outlet boxes for lighting cables	1.80
106	square yards cement concrete walks	1.80
370	square yards granolithic surfacing	1.00
320	feet 1-inch or 1½-inch steel duct for electric power cables	.30
1,225	feet 2-inch or 3½-inch steel pipe ducts for electric light cables	.50
106	feet 4-inch multiple terra cotta 2 x 2 ducts for electric cables	.50
980	feet Boston pattern fence	5.00
315	feet 8-inch vitrified pipe drain	.40
170	feet 10-inch vitrified pipe drain	.50
72	feet 15-inch vitrified pipe drain	.80
450	feet 30-inch reinforced concrete drain	3.80
2	4-inch discharge vertical sump pumps, complete	5,000.00
1	bronze door and frame	300.00
	Granite threshold, etc.	200.00
424	feet 3½-inch fibre conduit	.20
4	bases granite posts 3 feet 9 inches x 2 feet 9 inches x 12 inches	45.00
4	bases granite posts 3 feet 9 inches x 3 feet 3 inches x 12 inches	45.00

PERSONNEL

The labor organization for Coleman Bros. ran up to eighty-five and ninety men at one time. The work was in charge of Steven R. Berke, General Superintendent and Chief Engineer, Coleman Bros., Inc., Boston, Mass., with Patrick J. Burns as Job Superintendent. For the Metropolitan District Commission the work was designed in the office of and in charge of Edwin H. Rogers, Director of Park Engineering of the Commission with Benjamin R. Davis as Division Engineer and Edward P. McSweeney as Resident Engineer.

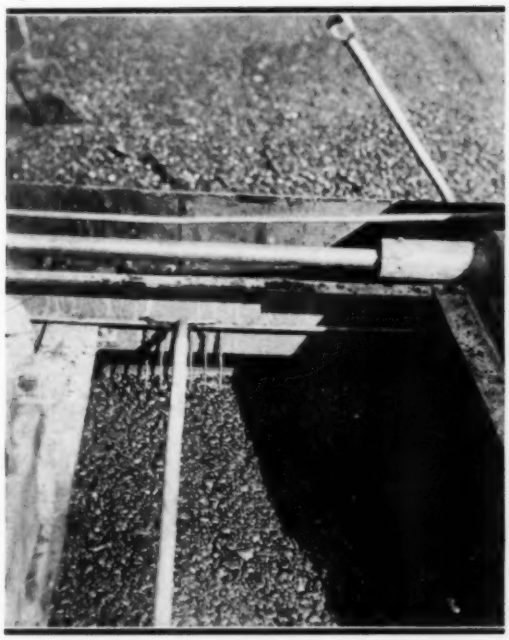
A Speedy Bridge Approach Repair

AFTER a delay of five years a contract was awarded and the east approach to the Spring Garden Street Bridge in Philadelphia was transformed from a series of pot holes to a smooth asphalt pavement in four working days. On Tuesday, November 3, bids were advertised for and plans formulated. On Wednesday morning workmen began tearing up the old road. Wednesday afternoon the high early strength concrete base was poured. On Thursday the concreting was finished and the sheet asphalt surface partly in place. Friday at 5.30 P. M. the job was finished.

Machine Finishing

on

Two-Course Asphalt Resurfacing



Binder Material as Left by the Screed of the Finishing Machine

The Detroit Asphalt Company, Detroit, Mich., Organized Job for Mechanical Handling of All Materials Insofar as Economical

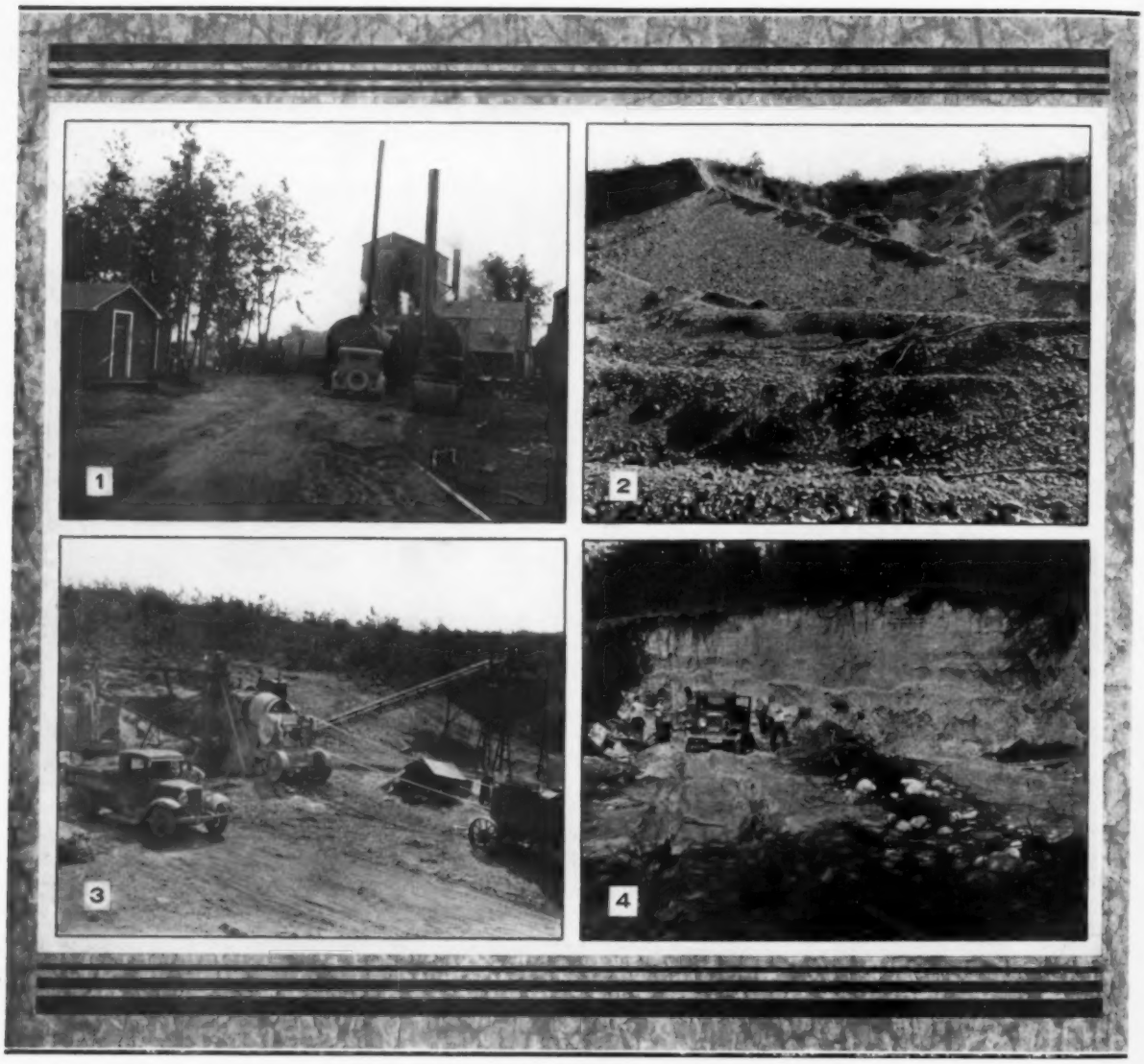
IN northern Michigan the State Highway Department has been confronted with the problem of securing a permanent type of surface to be economically placed on the existing gravel roads as well as to secure a type of construction which would be flexible enough to meet the extremely variable climatic conditions. There exist a great many miles of gravel surface roads in excellent condition but on which the maintenance is exceedingly high due to weather conditions. These roads are well adapted to surfacing with some type of permanent top, especially as the metal is of sufficient thickness to make a good base and the general grades are very uniform.

As the traffic is seasonal and the roads are used only about six months a year, an expensive type of pavement is not warranted. For several years, the State used a two-course asphaltic construction costing approximately $9,000 to $10,000 per mile, with hand methods for spreading. This type of construction worked out well under the existing conditions but it was somewhat disappointing as to the riding surface. To correct this, and to secure a better internal structure throughout, the use of a mechanical finishing machine was proposed. An Ord finisher was shipped to Kinglsey, Mich., and tried out on the Kingsley, Interlocken and Manton jobs with enough evidence of its adaptability to this type of construction that it was taken to St. Helen and used on the Detroit Asphalt Co. project at that place.

Work Redesigned to Fit Machine Operation

Prior to the starting of the St. Helen work various changes in mechanical finishing methods were tried, resulting in the redesigning of the St. Helen work to fit machine operation, primarily from the standpoint of specifying an 18 x 4-inch binder curb to be laid on each side of the existing old highway. This gave a true and substantial support for the steel asphalt forms and acted also as a strengthening member for the outer edges of the new slab. When using mechanical finishing machines the uniformity of the resulting road surfaces depends on true and solidly set forms, whether it is asphaltic pavement or concrete pavement that is being laid.

The asphalt plant was set up at St. Helen, Mich., to



ASPHALT PLANT AND AGGREGATE PRODUCTION

1. *The asphalt plant operated by crude oil and located at St. Helen, Mich.* 2. *The gravel bank from which the material was excavated by a pull scraper and elevated by belt conveyor to the screening plant.* 3. *The portable gravel screening and crushing plant* 4 *miles from the asphalt plant.* 4. *The local sand bank from which all sand was hand loaded and hauled* 13 *miles to the asphalt plant.*

handle the whole of State Project FO72-9. The plant was constructed by the mechanical forces of the Detroit Asphalt Co. and proved efficient in all details. It was built to take care of a 1,665-pound mixer and was operated by crude oil. All of the materials were handled by a Northwest crane. In the erection of the plant no detail was overlooked towards securing maximum efficiency of the work as a whole. This resulted in a daily average output of 640 tons of mixed material. The plant personnel consisted of one mixer man, one temperature man, one day engineer, one night engineer, one crane operator and master mechanic, one yard man and checker, one material checker, one dust man, one feeder man, one man unloading dust from cars and a plant foreman.

AGGREGATE PRODUCTION

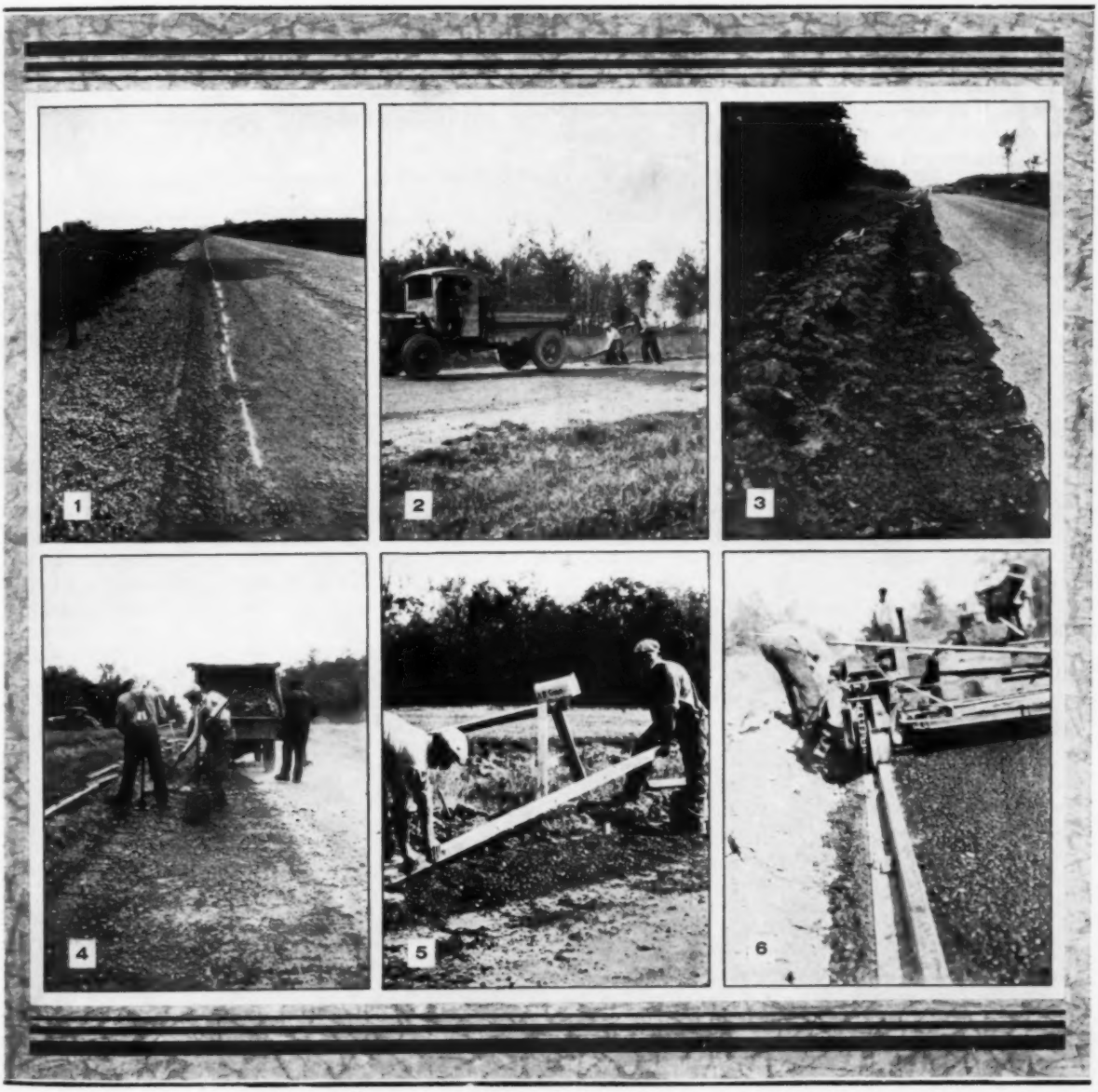
As there was a plentiful supply of local material, a gravel pit was located about 5 miles from the plant and a portable screening and crushing plant installed. Bins were erected to take care of the different sizes of aggregate and to secure quick loading of the trucks from this reserve supply. The sand bank was located about 13 miles from the plant. As it was not considered advisable to install equipment to load the sand into trucks, the loading was done by hand.

The transportation of both sand and gravel was handled by 2-ton International trucks. The sand bank was located in such relation to the paving project that they could carry a load of mixed asphalt from the plant and return with a load of sand or gravel.

PAVING OPERATIONS

The road which was surfaced consisted of a gravel road which was primed with 1/3-gallon of asphalt per square yard, before the two-course asphalt surface was laid. This maintained a dustless surface throughout the length of the job under trucking and quickly shed any rain, leaving a dry surface which cut down the loss of time following wet weather.

The State Highway Department specified a special 18 x 4-inch trench excavated alongside the existing road 10 feet 6 inches from the center line of the new pavement, and extending toward the center line a distance of 18 inches. The overall width of the finished pavement was 20 feet which left 6 inches on either side as a foundation for the 3-inch Blaw-Knox steel asphalt forms which carried the mechanical finisher. Line and grade stakes were set every 50 feet by the engineers, permitting the excavation of the trench well ahead of paving, and the setting up of the forms. Preliminary to the excavation of this trench an ordinary tennis court marker was used to make a guide line for the plowing. A heavy rooter plow drawn by a truck was then used to break two furrows and this was followed by a special plow carrying an unusually large moldboard and mounted on an old Army two-wheeled trailer. This special plow cleaned approximately 80 per cent of the trench, then two men dressed the trench with shovels, leaving the excavation at its proper dimensions. After this method had been developed and the routine



PREPARING THE TRENCH AND LAYING THE FORMS

1. *The primed surface of the gravel road showing the white line to guide the plowing for the bituminous curb trench.* 2. *Plowing the two-furrow trench.* 3. *The excavated* 18 *x* 4*-inch trench ready for the binder.* 4. *Placing and hand tamping the binder material in the curb trench.* 5. *Setting forms.* 6. *The steel asphalt forms on a firm bearing of binder material.*

established, it was easy to complete from 2,000 to 3,000 feet of trench in a few hours.

The construction of the 18 x 4-inch bituminous curb and the setting of the forms were carried on together, and usually about 1,000 ahead of the paving. A truck of binder would be delivered and spread directly into the trench and hand-tamped and the forms immediately bedded and set on the hot material. This gave a uniform foundation under the forms.

SPREADING THE BINDER AND SHEET TOP

The binder and sheet top were spread and laid with an Ord finishing machine equipped with two screeds with adjustable ends. The top was usually run in the morning and by 11 or 12 o'clock from 1,200 to 1,400 feet would have been completed whereupon the plant was shifted to binder. This routine also gave the curb and form gang an opportunity to lay another 1,000 feet of forms, so that when the switch to binder was made, there would be several thousand feet of forms set ahead. The top material was spotted and dumped in piles ahead of the finisher, and then spread by hand, so as to maintain a uniform amount ahead of the machine. The sheet mix was somewhat hard to handle because of the high dust content, but as a rule, this was overcome by close watching of the amount of material carried against the front screed of the finishing machine. To secure the necessary excess of the material to take care of the roller compaction, steel strips 2 inches wide and from ¼ to ½-inch thick were placed on top of the steel forms and held in place by inserting two ⅜-inch steel pins through the strip and into a hole in the form top. By varying these strips and closely checking the depth of the screeded surface a very close approximation to the required yield was maintained.

Two back rakers corrected any imperfections in the surface, and dressed up along the forms. As soon as the material had cooled sufficiently to allow seal rolling without blistering, it was rolled longitudinally from the outer edge toward the center with a tandem roller and followed by two others cross rolling. A noticeable feature on this work was the lack of "rocking" of the rollers on the machine spread top. This was due to the uniform thickness and density secured by the finishing machine.

As a rule, there was no time lost in the shift from top to binder. The trucks were so arranged that there would be several loads of binder waiting before the last load of top had been spread. Immediately after the last top was handled, the front screed would be dropped down between the forms the required depth by its adjustable ends, to handle the binder. The use of spreader boxes would be an ideal way to handle the material from the trucks to the grade, but as the grade varied in elevation, it was impossible to use them on the St. Helen job. The dump man would chain the tail gate of a truck to give a restricted opening and by watching the grade and regulating the speed of the truck as it moved ahead, a fairly uniform amount of material could be maintained in front of the finisher with a minimum amount of hand work.

As a result of the work of the finishing machine a very uniform distribution of the aggregates was secured. This is most important as it gives a tight, well-knit mass for the first rolling. When spreading the raking binder by hand on a variable base, a very loose layer of material is secured. This is due to its uneven thickness and its rolls comparatively rough with the unevenness transmitted to the sheet top course. Because of the screeding action of a finisher and the fact that it distributes the materials evenly on the top surface, it greatly assists in keying the aggregates before rolling and reduces the variable compaction to a minimum. As the screed of the finisher worked below the top of the road rail, making it necessary to allow for its travel back and forth, a ridge of material was left deposited along the inside of the forms. This was raked inward in such a manner as not to be noticeable when rolled.

When it was necessary to move the finisher quickly from binder to top or vice versa, the traction clutches were released and the finisher either pushed or pulled by one of the rollers. In this manner it could be moved several thousand feet in a few minutes. At the end of the day's work, the finisher was moved back to where top would be started in the morning.

HANDLING TRAFFIC

The St. Helen job was so located that detours would have been unduly long and as most of the traffic was foreign it was necessary to provide some means of letting traffic through the job most of the time. Saturday night and Sunday the work had to be thrown open entirely to traffic. To do this it was necessary to remove the finisher from the pavement and place it on the shoulders out of danger to traffic. This was done in about 20 minutes by the use of a pivoting bolster placed under the center of the finisher and on which it was swung so that it faced the shoulder and then was run under its own power on temporary wooden rails off the traveled way. This feature was considered at first rather a burden but after the finisher had been moved off the job several times, it was considered no more of a task than changing from binder to top. The forms were removed and taken ahead by the service truck and two men, and the work was so handled that this truck was available throughout most of the day for other duties.

LABOR ORGANIZATION

The average working day was 11½ hours. The labor organization was divided into the plowing and curb trench gang, the bituminous curb gang, form setting gang and slab gang which were made up as follows: the plowing and curb trench gang consisted of one man laying out a line, one man plowing and one service truck; the bituminous curb gang consisted of one raker, two spreaders and one tamper; the form setting crew consisted of one form setter and one helper; the slab crew consisted of one dumper and time keeper, four asphalt spreaders, one finishing machine operator, one riser plate man, one straight-edge man who also handled the cement, two back men and smoothers, and three roller men. While there was some shift of personnel during the day the above schedule was maintained quite uniformly.

PRODUCTION SCHEDULE

In the 20-day period between August 12 and September 1, 1931, an average of 2,573 square yards of top or 203 tons was laid per day with a daily average of 413 tons of binder, making a total tonnage average of 615 tons of material per day on a 12-mile haul.

The thickness of the top was checked regularly and was maintained very uniformly throughout the work. One factor which helped secure this uniform top thickness was the use of the finisher to lay the binder course.

The shoulder and ditch work was done under subcontract by E. Hill. The shoulders were 8 feet wide and seeded.

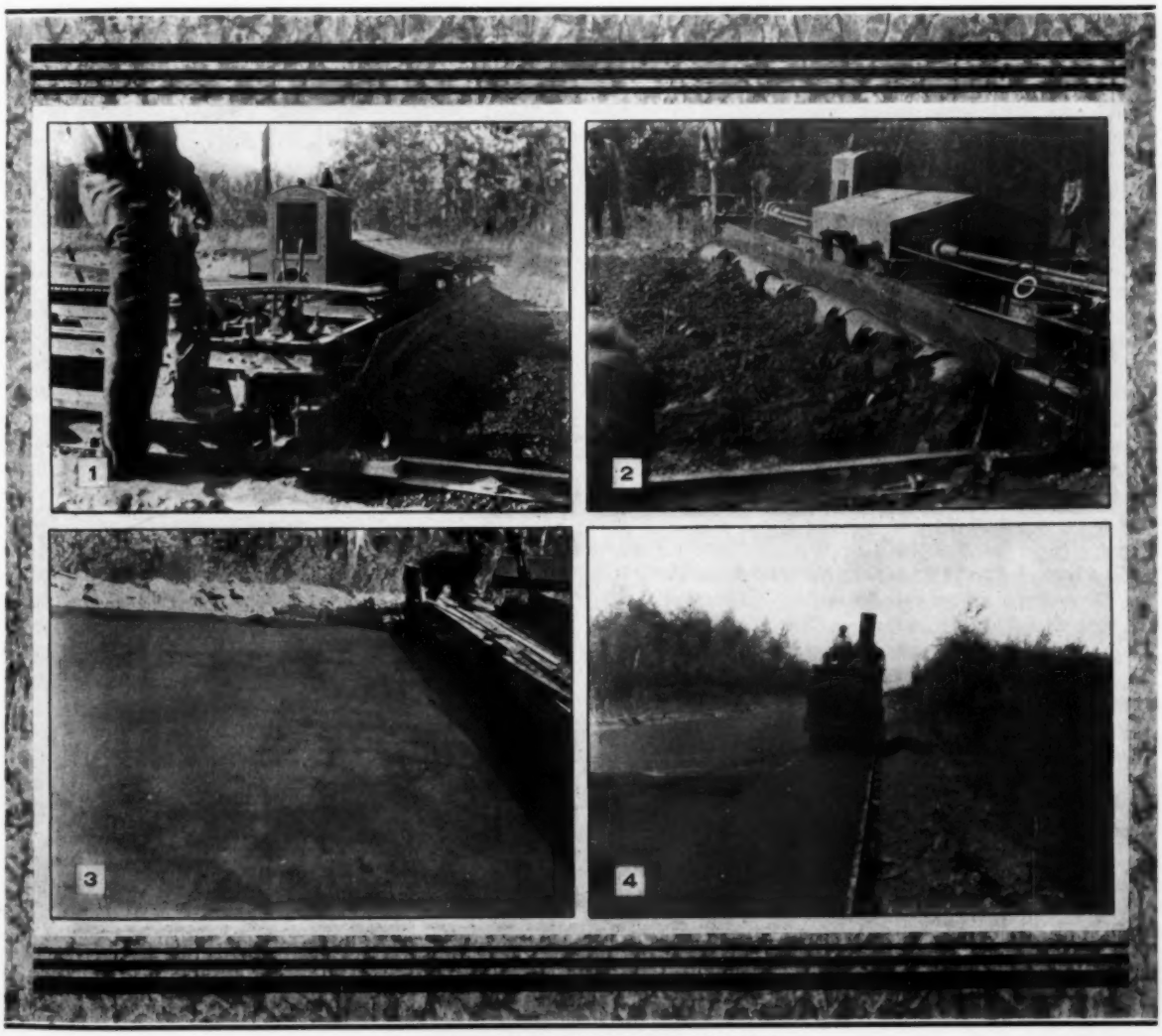
PERSONNEL

The St. Helen paving project on Michigan State Highway 55 from State Highway 76 to U. S. Route 27 was completed by the Detroit Asphalt Co., Detroit, Mich., under the direction of Albert P. Hannan. For the Michigan State Highway Department, Guy Green was Resident Engineer and Jim Hyde, Project Engineer.

Pulling Out Heavy Blocks of Granite with a Steam Shovel

HARD granite standing on edge was one of the problems A. Brazos & Sons, Inc., Middletown, Conn., ran into recently on the Boston Post Road near Old Saybrook, Conn., while building a 1½-mile cut-off. Digging was further hampered by a low-hanging power cable which could not be moved. Blasting was therefore confined to small shots of one to two pounds in perpendicular holes, 12 feet deep and spaced approximately 3 feet apart. With no chance to blast properly in this 460-foot cut, the contractors used their Bucyrus-Erie 42-B steam shovel to pull out the granite. The machine pulled out most of the rock with its teeth. Many of the granite rocks weighing around 10 tons were chained and lifted out. Some blocks weighing as much as 15 tons were removed in the same manner.

Approximately 19,000 cubic yards including 12,000 earth and 7,000 rock were excavated and removed in building the 32-foot grade. Some of the excavated stones were removed from the cut and used to build head walls for the culvert and also in building basins, the balance going into the fill. The haul, which averaged almost ¾-mile, was handled by six 4-yard Mack trucks.



MACHINE FINISHING AND ROLLING

1. *A side view of the finisher handling binder.* 2. *Sheet top material being carried by the front screed of the finishing machine.* 3. *The surface of sheet top as left by the finisher.* 4. *Longitudinal rolling close to the forms.*

The Editor Comments—

An Educational Campaign to Stimulate Highway Programs

During the convention of the American Road Builders' Association at Detroit in January, a Round Table Publicity Conference on Highway Program Extension was held to which editors, both newspaper and trade paper, advertising managers, advertising agency representatives and publicity men were invited. The discussions covered various fields of publicity which might be used to stimulate greater interest in the continuance of the highway program of the last 10 years.

Charles M. Upham, Engineer-Director, The American Road Builders' Association, pointed out that among state legislatures the clamor for roads has been smothered by a cry for lower taxes. Some counties have instituted a "highway holiday," particularly where the road work has been financed by direct tax. Among states and cities, the construction program for 1932 will probably be as great as in 1931, but the 1933 program needs watching. Already nine states are diverting their gas tax income to sea walls and insane hospitals, the propogation of oysters and similar distinctly non-highway activities. Forty-one states are diverting money to counties and in sixteen of these states the commonwealth has no jurisdiction whatsoever over the expenditure of the money.

Editors of two contemporaries in the highway field stated the beliefs that highway program extension publicity addressed to their readers would not be effective, as they were already very much interested in the continuance of intensive and extensive highway construction.

Readers of Contractors and Engineers Monthly are "live wires" in their communities. They are vitally interested in the continuance of the highway program and stand ready and eager to use their influence effectively in every possible legitimate manner. Our readers reside in the largest and the smallest communities and thus the distribution of their influence is exceedingly widespread. They know the editors of the local daily and weekly newspapers, editors who wield tremendous power in formulating public opinion in the suburban and rural districts. The balance of political power in this country is still in the smaller communities and in non-urban districts where good roads and particularly the construction of secondary roads of the farm-to-market type is necessary. Our readers can be focal points for effectively distributing well-prepared human interest and mildly statistical news releases through their abundant influence and widespread friendship with the rural press.

Readers, you are vitally interested in the continuance of highway construction. Make it your particular task to discuss highway construction with the influential men of your community and stimulate them to political activity in directing their representatives at the State Capitol to continue adequate appropriations for highway construction and maintenance and to prevent diversion of gas tax monies from highway construction.

The Spur of Bad Times

Under this title, W. R. Angell, President, Continental Motors Corp., has mailed to the press of America, a very interesting discussion of the opportunity for research which slack times afford to machinery manufacturers.

He states, "Bad times are good times for the development of new ideas, improved methods and new business. When things are slack, opportunity is afforded for work in the laboratory of the brain and the laboratory in the factory and the research department is put on its mettle. Bad times are also good times to take a mental inventory of everything pertaining to one's business, to study the lesson that experience should have taught and to take a look into the future as far as our too limited human intelligence will permit."

This statement applies to contractors just as much as it does to manufacturers. In this issue of Contractors and Engineers Monthly, appears an article, "New Methods—the Result of Winter's Thought," telling how one superintendent uses the slack time in the winter to develop new ideas, new pieces of equipment and methods which will make his job run more smoothly, more rapidly and more economically during the next construction season. This superintendent happens to be a particularly fine mechanic and so with one helper is able to produce his devices readily. It would be economical for any contractor to maintain a machine shop during the winter to develop equipment, either pooling the experience and ideas of the superintendents or permitting them to work individually.

At the Road Show in January, we talked with one manufacturer who was bemoaning the fact that there was nothing doing in his shop. I called his attention to the fact that it is the usual lament of manufacturers that when production is high and the shops are working overtime there is little or no time to make changes in their products without stopping production of older models and thus losing business. If these manufacturers would use the present time when their shops are nearly idle to develop more economical models, they will find themselves in the front rank leading industry out of the depression.

Theodore Reed Kendall

A Section of
CONTRACTORS
AND
ENGINEERS MONTHLY

The Consulting Engineer

Devoted to
News of Consultants
in the
Civil Engineering Field

Budgeting and Rationalizing Municipal Bond Issues

By

Morris Knowles,

President and Chief Engineer

and

Nathan B. Jacobs,

Vice President and Treasurer

Morris Knowles, Inc.

Pittsburgh, Penna.

DURING the past 20 years, there has been a constant increase in governmental expenditures. The substantial factor in this increase has been the financing of capital improvements by states and municipalities. The American public is providing on a generous basis the physical improvements in the way of highways and bridges, schools, public buildings, public utilities, drainage and sanitary projects, and such amenities as parks, golf courses, bathing facilities, hospitals, museums, etc., which this twentieth century existence has made necessary.

From the demands of the public, there has been created a large industry which has grown to stupendous proportions. The municipal, county and state bond industry represents present holdings estimated at approximately $12,000,000,000. During 1930, states and municipalities floated bond issues of about $1,400,000,000 and taking into consideration the temporary loans placed, the aggregate amount was $2,400,000,000. The amount ($1,400,000,000) invested in long term state and municipal bonds in 1930 was eight times greater than our total exports of crude foodstuffs, four times our exports of meat and meat products and three times our exports of semi-manufactured products.

The total capital of $12,000,000,000 invested in municipal, county and state bonds is equal to the total capital invested in the electric power industry which in the eyes of the American public is a colossal industry. Serious public attention should therefore be directed to a business or industry that owes $12,000,000,000 and that borrows $1,400,000,000 in one year, for this business is an important element or factor in the economic world.

It is only within the last few years that serious thought has been given to mounting municipal and state debts. Recently bankers, engineers and some public officials have realized the seriousness of undermined municipal credit created by abuses which have occurred in numerous cases of floating municipal bond issues. Studies have been made by bankers' associations and engineering organizations, as well as by interested individuals relative to correcting past evils and to setting up standards for future consideration and application.

Morris Knowles

The dangerous and unsound practices which have crept into this industry are varied and numerous, and not only have caused banking interests losses and regret, but have affected the individual investor who desires to put his money where it will be protected to the fullest extent and placed in safe securities. Abuses that have occurred are the issuing of bonds not legally valid, bonds vastly exceeding the reasonably useful life of the improvement for which they pay, municipal practices that conceal the essential facts, defaulting of bonds, interlocking combines and misleading information.

Independent impartial engineering reports should be obtained by the banking interests and the investment public to serve as a check and indorsement of the reliability and dependability of the recommended issues. The independent engineering report should deal with the economies of the enterprise as well as with technical features. Resolutions adopted by the American Institute of Consulting Engineers, Inc., referring largely to utility financing, set forth very clearly the need

(Continued on page 53)

The Consulting Engineer

A Section of

Contractors and Engineers Monthly

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Contents

Albright & Friel, Inc., Philadelphia, Pa..... 53
Bechtel, Bryant & Weber, Inc., Trenton, N. J..... 52
J. Paul Blundon, Keyser, W. Va..... 52
Robert O. Bradley & Co., Chickasha, Okla..... 52
Charles Foster, Duluth, Minn..... 52
Healey & Watt, Chicago, Ill..... 53
Carlton W. Jones, Baltimore, Md..... 52
L. J. Jordan, Charlotte, N. C..... 52
Morris Knowles, Inc., Pittsburgh, Pa..... 51
William L. Rockwell, Eagle Pass, Texas..... 53
Russell & Axon, St. Louis, Mo..... 52

A. S. T. M. Tentative Standards for 1931

THE Book of A.S.T.M. Standards is published triennially in November and contains all of the standards of the Society in their latest revised form. The Book of A.S.T.M. Tentative Standards is published annually in October and contains all of the tentative standards which are proposed standards, published for one or more years to elicit criticism before their formal adoption as standard by the Society. Although still in the trial stage of A.S.T.M. procedure, they represent the latest thought of the committees on the subjects covered and therefore are finding important applications in the various industries. The 1931 volume contains 180 tentative specifications, methods of tests, definitions of terms and recommended practices now in effect as well as proposed revisions of standards, published as tentative with a view of eliciting criticism of which the committees concerned will take due cognizance before recommending final action. This 1,008-page 1931 edition may be secured by non-members from the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Penna., paper-bound volumes costing $7.00 and cloth-bound volumes, $8.00.

Consulting Briefs

Robert O. Bradley & Co., Chickasha, Okla., is at present working on reports of the water supply and making a cost study for Anadarko, Okla., as well as a sewage and sewage disposal report for the same city, a report of the water treatment and cost study for Lawton, Okla., and a water and sewerage system report for Fort Sill, Okla., for the War Department. Under their supervision 4.733 miles of 20-foot reinforced concrete highway and three concrete highway bridges are being constructed for the U. S. War Department at Fort Sill, Okla., with O. W. Humphries, Major, Q.M.C., in charge.

Russell & Axon, 228-231 Hotel Roosevelt Bldg., St. Louis, Mo., report that they are now working on plans for water works extensions at St. Charles, Mo., water works improvements at Columbia, Ill., a water works distribution system at Millstadt, Ill., a sewerage system at Harrisburg, Ill., and power plants for St. Charles, Caruthersville and Perryville, Mo. Under their supervision a sewerage system is being installed in Millstadt, Ill., as well as a disposal plant for the Madison County Sanitarium at Edwardsville, Ill., and a pumping plant with tank and tower at Millstadt, Ill. Recently they were called as expert witnesses in the damage suit against the City of Troy, Mo., and in a damage suit against the City of West Plains, Mo.

J. Paul Blundon, Keyser, W. Va., and Charleston, W. Va., has recently added H. C. Schaid and C. F. Rice to his staff. He reports that at present he is working on plans for a filtration plant at Frostburg, Md., and appraisal of property of the Natural Gas Co. of West Virginia for the City of Wheeling, W. Va. Recently he was called as expert witness in the case of the City of Columbus vs. Columbus Gas & Fuel Co. and in the case of the City of Charleston, et al. vs. United Fuel Gas Co.

Carlton W. Jones, 5300 Gwinndale Ave., Woodlawn, Baltimore, Md., reports that he is preparing plans for a 600-room apartment house to be constructed in the suburbs of Baltimore, work for which has been under consideration for several years. Under his supervision industrial process cutting construction to meet the new low prices of products has been going on. This involved many interesting features and severe tests of resourcefulness as well as originality and improvements as the work progressed. He is also adapting a practical progressive bonus system.

Charles Foster, 512 Sellwood Bldg., Duluth, Minn., reports that he is now working on plans for a water supply and sewage treatment plant for the Nopeming Sanatorium at Nopeming, Minn. and for a 1,000-kilowatt turbine unit for Brookings, South Dakota.

L. J. Jordan, 1340 Harding Place, Charlotte, N. C., reports that he is supervising the construction of a dam for private development in Charlotte, N. C.

Bechtel, Bryant & Weber, Inc., 225 E. Hanover St., Trenton, N. J., have recently formed an association with Walter Hankin, an architect for 30 years in Trenton, N. J. They report that they are at present working on plans for a dam on the estate of Dr. Paul F. Sarubbi near Chester, N. J., and plans and reports on the cost and method of the construction of tennis courts for a boys camp near Clinton, N. J. Under their supervision the construction of the Pine Lake Park Estates dam, Jacob's Creek road paving, Sutherland road paving and other miscellaneous work is being carried on.

Healey & Watt, Consulting Engineers

THE association of Frank F. Healey and James H. Watt, in the partnership of HEALEY & WATT, Engineers, with offices at 33 No. LaSalle St., Chicago, has been announced. Major Healey, who for many years was manager of the engineering department of the State Bank of Chicago and later with Foreman-State Trust & Savings Bank, has been engaged in the field of civil engineering and appraisal work for more than three decades. He has designed and superintended the construction of all types of buildings, including many power plants, among them the $15,000,000 plant of the Acme Power Co., in Toledo, Ohio. He was formerly associated with A. Bentley & Sons, Contractors. During the World War he served as a major in the Construction Division of the Engineering Corps in the Army, in charge of all field work at Newport News.

Mr. Watt was associated with McClintic-Marshall Co. for seven years and later with Allen & Garcia, Consulting Engineers. He has just returned from Europe where he acted as consulting engineer in industrial construction projects during the past two years.

Healey & Watt will act as consulting engineers for all types of construction work and appraisers for all types of properties, including private residential, industrial and public works.

Engineers As Inventors

AN eight-page pamphlet entitled "Engineers as Inventors," prepared by Joseph Rossman, Ph.D., Patent Examiner, U. S. Patent Office, is a reprint from the August, 1931, issue of the *Journal of the Patent Office Society*. The pamphlet is a resumé of questionnaires sent out to engineers working in the largest organizations for information as to engineers' records and achievements and any inventions, and aims to bring out the point that although there are many engineers in the country, only a very small percentage can be called inventors. Most engineers are conservative and adhere to traditions, and there seems to be the feeling that when an engineer begins to invent things he loses caste with his profession because his work is new and he must be made to suffer doubt, protest and ridicule.

Albright & Friel, Inc., Consulting Engineers

CHESTER E. ALBRIGHT has recently announced the dissolution of the partnership of Albright & Mebus, of Philadelphia, and the organization of ALBRIGHT & FRIEL, INC., Consulting Engineers, with Mr. Albright as President and Francis S. Friel as Vice President and Treasurer. The new corporation will practice general consulting engineering, specializing in municipal work, including water supply and sewage disposal. In 1890 Mr. Albright opened an office in Philadelphia for the practice of civil engineering and in 1904 he established the firm of Albright & Mebus. At one time he served as Chief Engineer of the Bureau of Surveys of the City of Philadelphia. Mr. Friel was associated with Albright & Mebus from 1922 to the time of its dissolution.

Budgeting and Rationalizing Municipal Bond Issues

(*Continued from page 51*)

of unbiased and impartial engineering advice. By such reports the faith of the bond buyer will be restored in the integrity of the banker and many of the abuses of the past eliminated.

The essential basis for a consummate development of the financial program is a comprehensive city plan. The foundation upon which the financial program then rests will be sound and lasting and the future financial structure built on such a basis will not fail. After the city plan or survey is completed, the next step is the preparation of the financial program, worked out in close cooperation by the city planner, city administrator and the financial official. The purpose of such a program is to stabilize the fiscal demands made upon a city for capital expenditures as well as to prevent the old abuses in handling municipal bond issues and to obviate the all-too-frequent necessity of borrowing money to cover annual operating and fixed debt expenses. The preparation of such a plan and program is essentially the work of the municipal planning engineer. The basic data for the logical development and orderly procedure of preparing a systematic plan must of necessity be compiled by men of engineering training. The engineer is schooled in developing the reasons for and estimates of public improvements. Engineering is the foundation of a city's prosperity.

Training and experience in many lines are necessary for the engineer who is to carry to a successful completion the physical development and financial program of a city. He must be able to coordinate his knowledge of engineering, civic development and municipal improvements with a knowledge of accountancy. With the close coordination of all these various qualifications, the consultant of a community or municipality is able to develop and prepare a city plan and a financial program that will result in abundant benefits to the people of this generation as well as the generations to come.

The foregoing text is an abstract from a paper prepared by Morris Knowles, President and Chief Engineer, and Nathan B. Jacobs, Vice President and Treasurer, MORRIS KNOWLES, INC., Consulting Engineers, Pittsburgh, Penna., and presented before the recent annual convention of the American Society of Municipal Engineers which was held in Pittsburgh.

Large Canal Project in Texas

THE contract for the Quemado Valley lateral canal system, plans for which were prepared by WILLIAM L. ROCKWELL, for the Maverick County Water Control & Improvement District No. 1, Eagle Pass, Texas, was awarded to the Trinityfarm Construction Co., Dallas, Texas, in August. The work involves 32 miles of lateral canals, 750 cubic yards of concrete in outlet and head gates, farm bridges and measuring devices. On the main canal about 400,000 cubic yards of material is being handled per month. Three crews are lining the canal with Gunite, covering nearly 100,000 square feet per month. This work is being done by the Gunite Construction Co., of Kansas City, Mo.

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published in THE CONSULTING ENGINEER SECTION of CONTRACTORS AND ENGINEERS MONTHLY lists the Laboratories whose facilities are available for Contractors, Engineers and Municipalities.

Excavation and Sinking of Caissons at the New York Central Railroad Freight Terminal in New York

Caisson Sinking in Lower Manhattan

A $6,000,000 freight terminal and warehouse for the New York Central Railroad is now under construction in lower Manhattan closely adjacent to Pier 39. This terminal will cover three complete city blocks between West and Washington Streets and Charlton, King, West Houston and Clarkson Avenue along the Hudson River. The foundation of the structure consists of 8-foot circular caissons sunk 75 to 100 feet to bed rock. One caisson was not cast at a single setting, but was cast in sections, one on top of the other, each section being 15 to 20 feet high. There are 124 caissons per basement and there are three basements in the entire job. The handling of materials and the excavation within the caissons were done by nine Byers crane of ½ and ¾-yard capacity. The cranes moved from one caisson to the next and back again, removing earth after each new section had been poured and set. The excavated material was loaded into trucks for removal from the site. The ½-yard cranes were also used to carry 1-yard skip buckets of concrete from the 27-E mixer to the caisson forms. The cranes were also used to unload and handle structural and reinforced steel from trucks. The trucks stopped on the street level beside the excavation and the cranes in the basement reached over to pick up the steel, placing it in the basement. They also carried steel to the place where it was to be used. Finally it was rehandled by the cranes when spotted in the forms. This refers only to steel used in the substructure, work on which has now been completed. P. T. Cox Contracting Co., Inc., New York City, is the contractor for the project and the subcontractor on caisson work was Byrne Bros., Chicago, Ill.

Clearing the Right of Way in the West

THE problem of clearing brush and trees of medium size and thickness of growth is not unusual in many states. Such conditions as those encountered in the northern Pacific coastal highway construction are, however, somewhat unique. Not only does dense undergrowth occur, but trees of very large size, both standing and prone, must be felled or cleared away. Normal clearing costs where moderate sized trees and scattered underbrush are to be removed, may be about $250 per acre. In the heavily timbered country of the Northern California coast, the clearing may be as high as $1,200 to $3,000 per acre.

Clearing may include grubbing and removal of all stumps in the case of trees prone to rotting, but in many cases redwood stumps are not removed because of their known long life. Where stumps are removed, the allowance which must be made in excavation computations for filling stump holes is often a matter of considerable moment.

Trees of moderate size are pulled over with tractors, but in handling trees up to 18 feet in diameter, other methods are used. The organization for such work is divided into three groups of men known as "fallers," "buckers," and "blocking" crews. Trees which cannot be uprooted with tractors are felled by the "falling" crew and the stumps are afterwards blown out or blasted and removed in sections by the "blocking" crew.

Falling is somewhat of a problem when numerous trees more than 200 feet in height and averaging 12 to 16 feet in diameter must either be felled in a 100-foot right of way or must be dropped so that they will not injure trees which are outside the right of way. The work of falling is usually done by two "fallers" to each tree, working with axes and saws. The tree is first heavily notched with axes, after which the trunk is cut through with cross-cut saws. During the sawing, wedges are driven into the saw cut to prevent the tree from pinching the saw and to insure falling in the proper direction. The final cuts, however, determine the direction of the fall and it is here that the ultimate skill of the "faller" is exercised.

Following the "fallers," the "bucking" crew trims the felled trees and cuts them into merchantable lengths with drag saws. The stumps are then blasted and logs, stumps, and débris are removed from the right of way by the "blocking" crews.

On one project it was necessary to remove about 1,800 trees larger than 12 inches in diameter and ranging up to 18 feet in diameter. The cost of clearing approximated $7.00 per 1,000 feet board measure of standing timber, while stump removal averaged about $6.50 per stump.

From a discussion on pages 1520-21 of the *Proceedings*, American Society of Civil Engineers, Volume 57, Number 9.

Compact Sharpener Set-Up Services Heavy Rock Job

OUT in the State of Washington the well-known American Canyon Road which squeezes its way through rock and cliff between Ellensburg and Roja, Washington, is now being widened and straightened to handle better the increasing traffic along this route. The contract was awarded last summer to George Abraham, Washington highway contractor, for widening this road from Ellensburg to the Moxee Tunnel. This contract called for the removal of about 229,500 cubic yards of rock over a distance of 11.2 miles.

To handle this extensive rock work, George Abraham was supplied by the Clyde Equipment Co., Seattle, Wash., with two 220-foot and one 110-foot Sullivan portable air compressors and four 40-pound Rotators. Inasmuch as constant pounding away on this hard rock quickly dulled the steel, Mr. Abraham set up a shanty with a 1,100-pound drill sharpener, an oil drill steel heating furnace and a 66-foot portable compressor, all Sullivan equipment. The little compressor furnished an ample supply of air for both the furnace and the sharpener. The illustration shows the shanty without its roof.

The Drill Sharpening Set-Up in the Roofless Shanty on the American Canyon Road Job

Construction Industry News

Blaw-Knox Co., Pittsburgh, Penna., has acquired the exclusive manufacturing and sales rights of the Wiley concrete bucket, formerly manufactured and sold by the Dayton Whirley Co., Dayton, Ohio. This product will now be known as the Blaw-Knox concrete bucket.

Allis-Chalmers Tractor Division, Milwaukee, Wis., has announced the purchase of the line of graders built by the Ryan Manufacturing Co., Chicago, Ill. The grader line will be manufactured in La Porte, Ind., in the Advance-Rumley plant which was recently acquired by Allis-Chalmers.

The Ryan line consists of power-controlled leaning frame, leaning wheel blade graders in three sizes and a motor patrol unit. One feature of this line is the ease of shifting the grader's weight from one wheel to the other, to conform with the road conditions encountered. These graders will supplement and round out the line of track-type tractors, industrial wheel type tractors and industrial equipment now marketed through Allis-Chalmers dealers.

The Arthur A. Johnson Corp., Contractors, 3rd and West Aves., Long Island City, New York, has announced the purchase of the assets and good will of McRae Paint Products, Inc., and McEverlast, Inc., manufacturing and selling units engaged in the distribution of the well known Hunt process of curing concrete and McEverlast pipe line coatings. Arthur A. Johnson, President, states that a new corporation will be formed which will combine the activities of the old company continuing the business on a basis of national and international distribution. G. R. March, formerly Vice President and Eastern Manager of McEverlast, Inc., will be associated with Johnson. The names of the officers of the new Johnson-March Corp., will be announced in the near future.

Four Wheel Drive Auto Co., Clintonville, Wis., has announced the appointment of J. R. Gray as District Sales Manager in charge of the Eastern Pennsylvania and Southern New Jersey territory. Mr. Gray has been associated with the FWD organization for fourteen years, during the past three of which he has been in charge of sales in southwestern Wisconsin.

The Ames Baldwin Wyoming Shovel Co., has announced the removal of its general offices to Parkersburg, West Va., to centralize the activities of the company, to better control operations and to expedite production and shipments. This will have no effect on the operation of the North Easton, Mass. plant which will continue to be the eastern manufacturing unit, and its customers can continue to send their orders and inquiries to the office to which they have been accustomed. If there is any doubt, direction to Parkersburg will bring prompt attention. The removal to Parkersburg covers the following officers: Richard Harte, President, G. G. Moore, Asst. to the President, L. J. Reay, Treasurer, N. T. Jacobs, General Sales Manager, H. T. Potter, Merchandise and Advertising Director, Vaughan Horner,General Purchasing Manager and E. T. Nipher from Anderson, Ind., the other officers being from North Easton, Mass.

Colas Roads, Inc., Chanin Bldg., New York, J. J. Harvey, Jr., President, has become the holding company for the organizations which will market Colas and emulsified asphalt for road work throughout the United States. Shell Eastern Petroleum Products, Inc., New York City, with J. S. Sawyer, Manager, will market Colas on the Atlantic seaboard. Shell Petroleum Corp., St. Louis, David Waxman, Manager, will market Colas in the Central States. Shell Oil Co., San Francisco, will continue to market Colas on the Pacific coast area west of the Rockies with J. F. McSwain, Manager. Colas Roads, Ltd., Toronto, with R. G. Wace as manager, will handle Canadian sales. Compania Mexicana, El Aguila, Apartado 150, Rampico, Mexico, with Allen Payne as Manager, will handle sales in the Republic of Mexico.

Independent Pneumatic Tool Co., Chicago, Ill., has announced the removal of its Cleveland office from the Union Trust Building to 1740 East 12th Street. Hayden F. White is manager of this office.

Medusa Portland Cement Co., 1002 Engineers Bldg., Cleveland, Ohio, has announced that it will act as distributor for the entire output of rust-proof coatings sold under the trade name of Rust-Oy manufactured by the Studebaker Chemical Co., Elyria, Ohio.

Worthington Pump & Machinery Corp., Harrison, N. J., has announced the appointment of Clarence E. Searle as Vice President in charge of sales. Mr. Searle has been General Representative in charge of sales for seventeen years and was formerly associated with the Allis-Chalmers organization. Clarence N. Barney, for the past fourteen years Secretary and General Counsel, has been appointed Secretary-Treasurer and General Counsel.

Winter Concreting on a 180-Foot Bridge

(*Continued from page 38*)

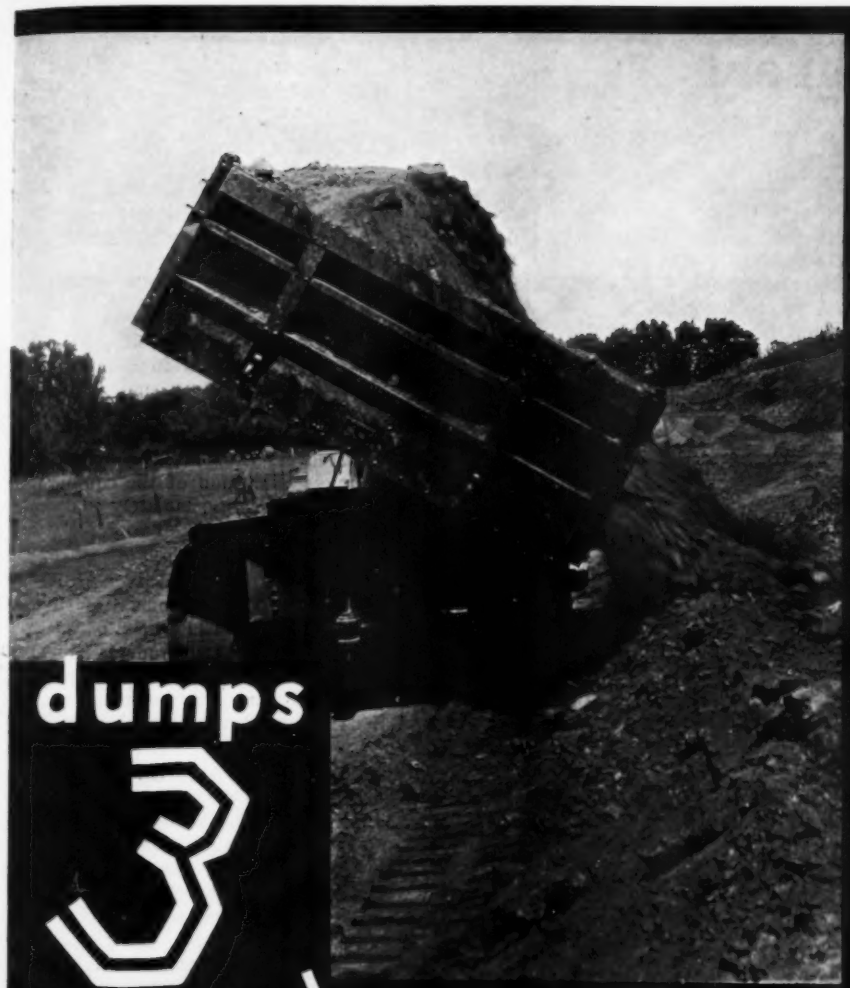
day with the sections alternating so that no two adjacent sections were poured the same day. Expansion joints ¾-inch in thickness and the full depth of the slab were placed between each of the six sections. The forms for the sections were built up of 1 x 6-inch lumber held in place by pieces of old steel sheet piling and cement bags.

QUANTITIES

There were 60 cubic yards of dry excavation on this structure and 1,017 cubic yards of wet excavation. There were 123,059 pounds of reinforcing steel used in the concrete section and in addition 283,430 pounds of structural steel. This structural steel carried the floor slab and was not encased in concrete. The structure as viewed from above and the sides gives the impression that it is built entirely of concrete but the load from the floor slab is carried to the piers by the structural steel members. A total of 1,500 yards of Grade A concrete was used in the structure.

PERSONNEL

The contract for the bridge, which was separate from the paving contract on either side of the bridge, was completed three months ahead of schedule with a base organization of eight men and a foreman. The bridge contractor was W. J. Anschutz of Saginaw, Mich., for whom F. L. Beean was Superintendent throughout the work. For the State Department of Highways, Bridge Division, the work was under the supervision of H. G. Oakes, Division Engineer, L. R. Crane, Division Bridge Engineer and C. C. Johnson, Inspector.



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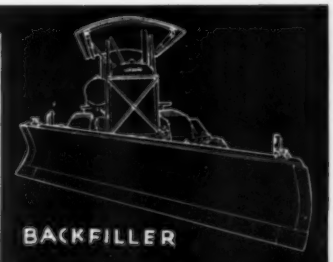
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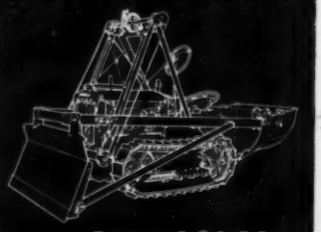
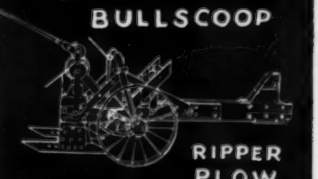
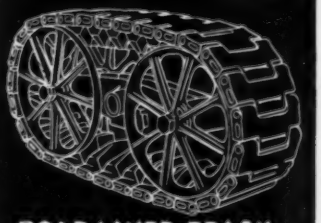
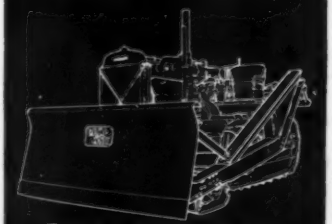
3 WAY DUMP WAGON


BULLSCOOP


RIPPER PLOW


ROAD LAYER TRACK

CRAWLER WAGON


BULLDOZER

ROLL OVER SCRAPER

Dumping to the right, left or rear, with one man operation, this LaPlant-Choate 3-way Dump Wagon brings the time saving advantages of speed, maneuverability and positive Hydraulic control.

Ideal for use in widening shoulders, building new roadways, hauling in quarries—this wagon can haul and dump the largest rock or the finest earth with quickness and ease.

This 3-way Dump body is mounted on the famous LaPlant-Choate "Roadlayer" Tracks.

Write for illustrated folder which describes in detail dumping "on the fly" and the way to greater profits with LaPlant-Choate 3-way Dump Wagons.

For Complete Information. Write name of product on lower portion of page. Attach to your letterhead and mail to us.

LA PLANT-CHOATE

MFG. CO. INC. CEDAR RAPIDS, IA. U.S.A.

EARTH MOVING EQUIPMENT

The Equipment Distributor

The Associated Equipment Distributors at its annual meeting in Detroit January 9 and 10, 1932, elected the following officers for the coming year: President, E. K. Hurst, Western Material Co., Sioux Falls, S. D.; 1st Vice President, Carl E. Baker, Smith Booth Usher Co., Los Angeles, Calif.; 2nd Vice President, R. R. Nixon, Nixon-Hasselle Co., Chattanooga, Tenn.; Secretary, A. C. Blaisdell, Queen City Supply Co., Cincinnati, Ohio; Treasurer, H. W. Fletcher, Fletcher Equipment Co., Inc., New Orleans, La.; Directors, G. E. Hillsman, The G. E. Hillsman Co., Chicago, Ill.; Victor L. Phillips, the Victor L. Phillips Co., Kansas City, Mo.; Thorman W. Rosholt, Thorman W. Rosholt Co., Minneapolis, Minn.; E. W. Gierke, Gierke-Robinson Co., Davenport, Iowa and John C. Louis, John C. Louis Co., Baltimore, Md.

Syracuse Supply Co., Syracuse, N. Y., has been appointed the exclusive distributor in the Central New York territory for the National Equipment Corp., The Clyde Iron Works and the Caterpillar Tractor Co. A new service warehouse with spare parts stock will be maintained for Caterpillar owners throughout this territory.

W. T. Walsh Equipment Co., Cleveland, Ohio, has recently been appointed distributor to handle the complete line of 26 different machines manufactured by the Byers Machine Co., Ravenna, Ohio.

The Interstate Equipment Corp., formerly located in Newark, N. J., has moved to 51 Westfield Ave., Elizabeth, N. J., where it will carry the same line as in Newark.

Mahoney-Clarke, Inc., New York City, has recently been appointed distributor for the Lakewood Engineering Co., and for the Jaeger Machine Co., Columbus, Ohio. James A. Campion, formerly of the Lakewood organization, has recently joined the sales force of Mahoney-Clarke.

The Office and Showroom of the Smith Booth Usher Co.

Smith Booth Usher Co., Los Angeles, Calif., has recently moved its Construction Equipment Division to new quarters at the corner of Fifteenth Street and Santa Fe Avenue in Los Angeles, and in an adjoining building is located the warehouse, parts department and shop. In this new location, which covers over 55,000 square feet of space, will be a complete exhibition of the equipment carried by this company, as well as a completely equipped parts and service department.

Arizona Tractor & Equipment Co., Phoenix, Ariz., recently had on exhibition at the 1931 Arizona State Fair, the only large fair in Arizona, $31,000 worth of equipment, including Caterpillar tractors and graders, Killefer road rippers, scrapers and scarifiers, an Atlas scraper, a Willamette-Ersted hoist, a Schramm air compressor and jack hammer, as well as various agricultural implements.

O. B. Avery Co., 1325 Macklind Ave., St. Louis, Mo., has recently secured the Austin-Western and Western Wheeled Scraper accounts, including Austin and Western blade graders, motor graders, elevating graders, Western crushing and screening plants, Austin gyratory crushers, Austin rollers, Western crawler and horse drawn wagons, Austin street sweepers, sprinkling wagons, and road oilers, the Austin Badger shovel, the Austin motor pick-up sweeper, and the Western Wheeled Scraper Co. line of small tools, fresnos, plows, etc.

C. V. Pierce Co., Inc., Pleasantville, N. Y., has announced the removal of its Poughkeepsie office to 178 South Robinson Ave., Newburgh, N. Y., handling the same equipment as heretofore.

Some of the Members of the Associated Equipment Distributors at Their Annual Meeting in Detroit, January, 1932

MORE DIRT

. . moved faster - - at less cost . .

Read why EUCLID equipment moves faster, lasts longer and nets you bigger profits . . . .

Suppose someone had told you—a few years ago—that you could move dirt at the price you can today and still make a profit. You'd have called him crazy!

But you *are* making a profit—or you wouldn't be in business—and there's no reason why you shouldn't make more.

Other men are doing it—with the help of Euclid Wagons. They've found that Euclid is the best investment they can make when they want to cut their operating costs.

For one thing, Euclid equipment lasts longer. It's built to stand up under punishing service. It costs less to keep up, too. And then Euclid engineers pay attention to all the details, even the small ones that save costly minutes on the job. The Euclid Wagon, for example, due to its success, has become a distinct type. Its principle of balance together with its light running and easy handling qualities have made it the outstanding hauling unit of the past few years.

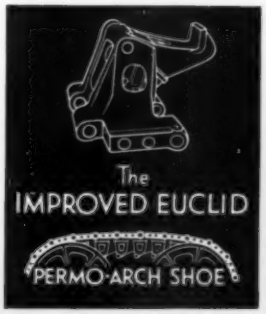
Consider also its drawbar, which is placed so that the tractor can under-cut it and make a shorter, quicker turn. Then, too, there is the Euclid patented winding device, that is easy to operate, has absolute safety and is trouble free. You will be interested in the Euclid Bulldozer that leaves the tractor's drawbar free to hook up with a Euclid Tamping Roller or other equipment, thus allowing your tractor to do double duty.

Then there are those special digging teeth for Euclid Wheelers. They help to tear up many a tough patch of pay dirt. Check up on Euclid's Rotary Scrapers—they have proved to be a very necessary and efficient tool on all dirt moving jobs.

Small things? Perhaps. But every one of them helps to whittle away your hauling costs!

There are many other improvements in the improved Euclid line that will interest you and your pocketbook. Be sure to see what Euclid has before you order any new equipment. The Euclid dealer in your community has the facts about Euclid's long life and lower upkeep cost.

Getting ready for the World's Fair. These Euclid 8-yard wagons behind a "Caterpillar" Sixty are helping prepare the ground



The improved Euclid "Track-Wheel" holds its arch far longer than ever before. The new *drop forged* Hook is separate from the track shoe and can be replaced at a low cost, thus assuring full arch-life of the Euclid Track

Quick turning like this speeds up trips to the dump and back

THE EUCLID ROAD MACHINERY COMPANY
CLEVELAND OHIO

A Portion of the Display Room in the New Quarters of Garlinghouse Bros., Los Angeles, Calif.

Garlinghouse Bros., Los Angeles, Calif., moved last fall to its permanent home at 2416 E. 16th Street, just opposite its old location. The building covers 20,000 square feet and is equipped with an electric traveling crane, shop and railroad spur track facilities.

Boehck Equipment Co., Milwaukee, Wis., has recently been appointed by the Byers Machine Co., of Ravenna, Ohio, as distributor for the entire Byers line of cranes, shovels and excavators.

Pacific Hoist & Derrick Co., Seattle, Wash., recently moved from its old location at 818 First Avenue South to the Machinery Mart at 3200 Fourth Avenue South, which was designed for the purpose of combining the sales representation of different dealers in non-competing commodities and housing a central warehouse and service system.

Crook Co., Los Angeles, Calif., has been appointed distributor for the line of construction equipment manufacturned by the Sullivan Machinery Co., including portable and stationary air compressors, rock drills, drill sharpening machines, concrete breakers, clay spaders and portable hoists.

Francis Wagner Co., El Paso, Texas, has merged with the Modern Engineering Co., also of El Paso, the new firm to be known as the Modern Engineering Co., Inc. The combined facilities of both companies have been moved to 1600 Texas Street, where both office and warehouse will be located. Francis Wagner is President and General Manager of the new company, William J. Chesak is Secretary and Treasurer and H. H. Logan, an associate of the organization.

Distributors' Bulletin Board

The distributors of construction equipment listed below have made changes this month in their cards appearing in the Distributors' Directory on pages 83 to 107 of this issue of CONTRACTORS AND ENGINEERS MONTHLY:

Bluefield Supply Co., Bluefield, W. Va.
O. B. Avery Co., St. Louis, Mo.
Bowen Machy. Co., Philadelphia, Pa.
Brewster & Williams, Inc., Syracuse, N. Y.
Bublitz Machy. Co., Kansas City, Mo.
Concrete Machy. & Supply Co., Los Angeles, Calif.
Drott Tractor Co., Inc., Milwaukee, Wis.
Elton T. Fair Co., Denver, Colo.
Fickeissen-Finney Equipment Co., St. Louis, Mo.
Hedge & Mattheis Co., Boston, Mass.
Hunter Machy. Co., Milwaukee, Wis.
Johnson & Dealaman, Inc., Newark, N. J.
John R. Key, Carthage, Mo.
Loggers & Contractors Machy. Co., Portland, Ore.
W. B. Louer Co., Chicago, Ill.
Mahoney-Clarke, Inc., New York, N. Y.
E. A. Martin Machy. Co., Joplin, Mo.
W. A. Nelson Equipment Co., Milwaukee, Wis.
Ronstadt Hardware & Machy. Co., Tucson, Ariz.
Superior Construction Equipment Co., Chicago, Ill.
Standard Machy. and Equipment Co., Spartanburg, S. C.
Syracuse Supply Co., Syracuse, N. Y.
Eugene F. Van Name, Horseheads, N. Y.

SHOWROOM OF THE LOUISIANA ROAD MACHINERY CO., INC., 1111 JULIA STREET, NEW ORLEANS, LA.

In the photograph are shown, in addition to three pieces of construction equipment, from left to right, Ed. J. Saxton, Birmingham, Ala., Branch Manager of Galion Iron Works & Mfg. Co.; J. D. Murphy, Cleveland Tractor Co., representative from Jackson, Miss.; Miss Alice Stentz, Secretary and Treasurer, Louisiana Road Machinery Co.; M. Cormier, Police Juror of Arcadia Parish, Church Point, La.; R. B. Berry, Vice President and General Manager, Louisiana Road Machinery Co.; A. J. Thomas, President, Louisiana Road Machinery Co.; and H. W. Patterson, service man for Cletrac.

"PIONEER"

PORTABLE GRAVEL PLANTS

FOR LOW-COST AGGREGATES

PATRICK CLINE, INC.
CONTRACTING ENGINEERS
Las Vegas Nevada Sept. 11, 1931

Harron, Rickard & McCone Co.,
2205 Santa Fe Ave.,
Los Angeles, Calif.

Attention: Mr. Todd

Dear Sirs:

You will no doubt be interested in the following information regarding the #12 - B Pioneer Duplex, Screening, Crushing, and Loading Plant we purchased from you the early part of this year.

This plant has operated very successfully in the present pit. In the month of August for thirteen days we averaged better than one thousand yards per day, and on three successive days better than twelve hundred yards per shift.

The State Highway Department tests show that only thirty percent of the aggregate passed ten mesh screen, and that we also crushed and rolled thirty four percent of the aggregate.

During the entire month of August we ran twenty eight thousand yards through our Pioneer Plant and was off one Sunday and two days on account of rain, and remember that this is only one shift operation. We loaded the plant with a 301 Koehring shovel and three Chevrolet dump trucks. There was only one forty minute breakdown during the whole month.

Yours very truly,
PATRICK CLINE, INC.
By Patrick Cline
Patrick Cline - Vice Pres.

Picture No. 1 (at right) is the 12-B Pioneer Duplex Screening, Crushing and Loading Plant, which Patrick Cline, of Las Vegas, Nev. describes in letter produced above. Picture No. 2 is another view of the same plant. In spite of large amount of fines rejected, no additional power unit was required.

PIONEER GRAVEL EQUIPMENT MFG. CO.
1515 CENTRAL AVE., MINNEAPOLIS, MINN.

Write for name of nearest Pioneer Distributor

New Road-Mix Machine for Bituminous Pavement

THE new bituminous paving machine announced by Barber-Greene Co., 485 West Park Ave., Aurora, Ill., provides a continuous system of mixing, laying, spreading and tamping bituminous roads in one operation and without the use of forms. The machine will complete one mile of road per 10-hour day. There are two units to the machine, the Loader-Mixer and the Spreader-Tamper, both of which are compactly designed.

If a gravel road is to be resurfaced it should be primed with 13 to 18-viscosity tar about one week before it is to be paved. Then washed gravel aggregate is spread in a windrow from a spreader box attached to a truck to provide sufficient material for the width and thickness of the road. This windrow is laid down in the center of the road and is the most advantageous way of storing the aggregate because, in case of rain, drying is simply a matter of opening the windrow with a blade, allowing the wind and sun to get to it and closing it again after it is dry. The bituminous materials for the road mix are brought to the Barber-Greene mixing machine by a distributor truck which runs up one side of the windrow while local traffic uses the road on the far side of the windrow. The Loader-Mixer unit of the machine is similar in appearance to the standard Barber-Greene bucket loader equipped with a spiral type pick-up feeder, a storage hopper, spray chamber, and a double pug mill. Its function is to gather and accurately proportion the aggregate and bitumen, thoroughly and uniformly coat the stone, and discharge the mixed material into or in front of the Barber-Greene Spreader-Tamper unit, which follows immediately behind it. As the Loader-Mixer moves forward the spiral feed works into the windrow and the buckets take the aggregate up to the storage hopper. The spiral feeder picks up over a width of 10 feet and is positive and mixes the aggregates as they are picked up. Immediately behind the spiral feeder is the clean-up scraper which adjusts itself to crowned or irregular road surfaces, and cuts through the hard surface, insuring a thorough clean-up. A content gage shows the quantity of aggregate in the hopper. A discharge chute on the side opposite the operator discharges any excess material into a truck when necessary which in turn takes the material to a lean spot in the windrow.

The floor of the hopper is an apron conveyor on which the material is delivered through an adjustable calibrated gate, allowing an accurately measured quantity of material to pass. As the material falls off of the discharge end of the conveyor, it tumbles through a system of baffles and nozzles, where it is thoroughly sprayed with bitumen under pressure. From this complete bituminous bath, the material falls into a pug mill where it is mixed. The mill is made up of two shafts with paddles forming a positive continuous type of mixer of large capacity.

The Spreader-Tamper unit spans the road from shoulder to shoulder. It is mounted on and propelled by two crawlers. The material is first spread from the center across the road by means of two horizontal spiral ribbon screws, one for each half of the road. They may be operated independently to compensate for uneven distribution or consumption. Immediately behind the screw spreader is a tamper with an overall width of 1½ inches divided into two steps ¾-inch wide and ¾-inch deep, which are important in forcing the aggregates into place. Approximately 6,000 pounds weight is on the tamper at the bottom of the down stroke. The screed which is immediately behind the tamper is 6 inches wide and operates a half cycle behind the oscillations of the tamper.

A particularly interesting feature of the Spreader-Tamper unit is an ingenious arrangement of shoes and evener levers which give the road an even surface contour and uniform density from top to bottom. Because of the continuous operation of this machine, it is not more than two minutes from the time aggregate is picked up from the windrow until it is placed in the completed road which is immediately opened to traffic.

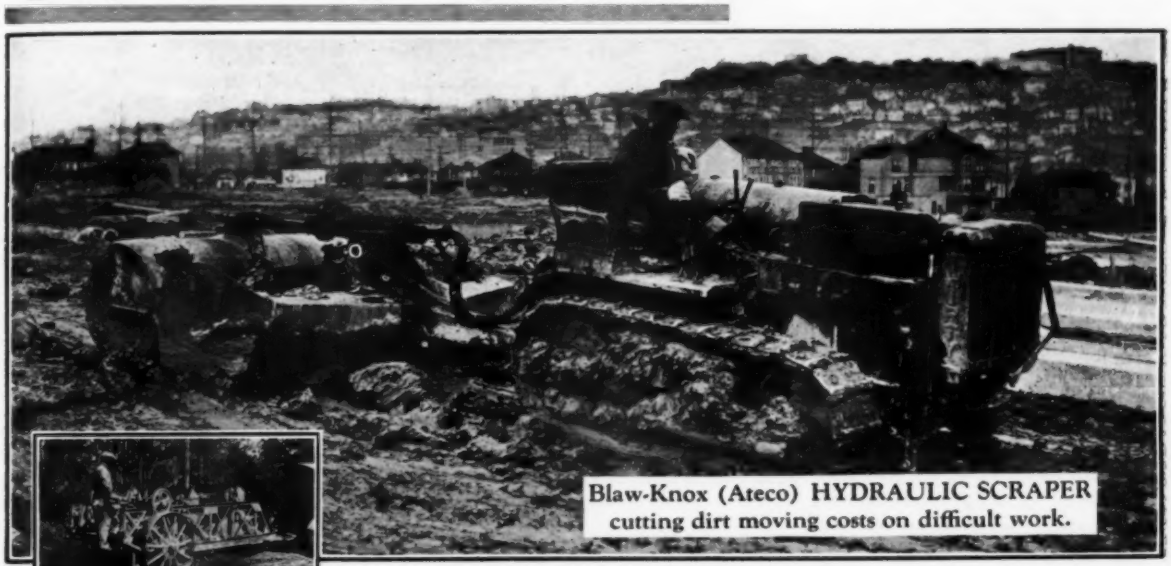
A Heavy-Duty Tractor-Mounted Hoist

A HOIST designed to meet the demands for a portable hoist for use on heavy work is manufactured by the Resistcor Engineering Corp., Muskogee, Okla. This Seminole hoist is mounted on a Trackson-equipped tractor and is easily attached or removed. It is operated and entirely controlled from the driver's seat, the hoist being chain driven from a White two-speed power take-off. A reverse drive on the countershaft gives the machine two speeds in reverse.

The mounting parts are of structural steel shapes and steel castings. The ring gear is of cut steel and the drive pinion of high carbon steel, heat-treated. The bearings are standard Bunting bronze and ball and the brake lining of woven asbestos. The hoist has a capacity of 4,000 feet of ⅜-inch cable, 2,600 feet of ½-inch cable, 1,650 feet of ⅝-inch cable and 1,150 feet of ¾-inch cable. It has a single line speed of 53.3 feet per minute in high and 23.6 feet per minute in low.

The B-G Bituminous Paving Machine at Work Showing, from Left to Right, the Windrow of Stone, the Bituminous Distributor Supplying Asphalt to the Machine, the Loader-Mixer Unit, the Spreader-Tamper Unit and the Completed Road

NOW—ESTABLISH NEW AND LOWER DIRT MOVING AND GRADING COSTS



Blaw-Knox (Ateco) HYDRAULIC SCRAPER
cutting dirt moving costs on difficult work.

WAGON GRADER

BULLDOZER

TAMPING ROLLER

SCARIFIER

Put your dirt moving costs down where they belong---as low as 5 cents per cubic yard in many instances.

Blaw-Knox Equipment does it.

This impressive line-up of dirt moving machinery is breaking cost records everywhere.

Low in first cost---low in maintenance. Highly efficient---Blaw-Knox Dirt Moving Equipment often pays for itself on the first job.

Let a Blaw-Knox dirt moving expert show you how costs can be lowered on your present contract. Give full details---a sketch will be helpful.

If you don't have a job at the present time, keep this page as a memorandum to write Blaw-Knox when you get one.

Get Blaw-Knox Catalog No. 1310.

Fill in and mail this coupon

BLAW-KNOX COMPANY, 2067 Farmers Bank Building, Pittsburgh, Pa.

Send me complete information about the Blaw-Knox (Ateco) Hydraulic Scraper and the complete line of Blaw-Knox (Ateco) Dirt Moving Equipment.

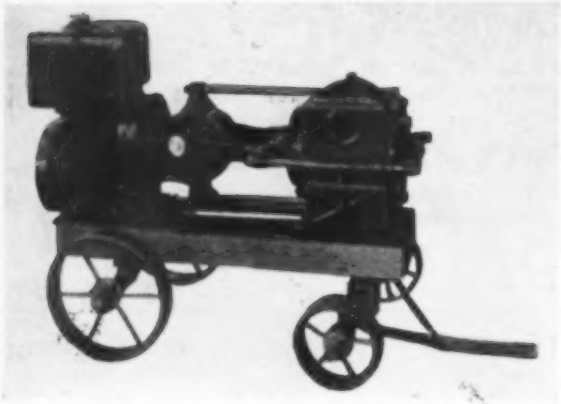
Name_____

Company_____

Street_____

City_____ State_____

BLAW-KNOX



The New Parker-Adnun Pump

A Double-Acting Diaphragm Pump

EXPERIENCED contractors are familiar with the Parker contractors' pump designed and built about 1909 by A. A. Parker. This portable unit has been redesigned and its efficiency increased by the Adnun Engineering & Manufacturing Co., Nunda, N. Y. The engine is now more powerful, being of the latest automotive type, running at 1,200 rpm, sufficient to operate the pump at 160-foot head under average conditions. Timken and Hyatt roller bearings are used throughout and the transmission is enclosed and runs in an oil bath. Three strong braces hold the pump and engine in one compact unit, giving it greater rigidity.

The moving parts are enclosed, the connecting rods being protected from dirt and grit. The pump and engine are mounted on a welded steel base with four steel wheels. The Parker-Adnun portable double diaphragm pump will handle up to 8,000 gallons of dirty water per hour on only 1½ quarts of gasoline. It has sufficient power to dispose of the water at any reasonable distance, even over a hill if necessary. This pump keeps on working whether it sucks air or water and reprimes itself whenever necessary. It is particularly effective as a trench pump, a force pump, an odorless excavator for cesspools and vaults or as a tank pump for railroad and road building. The hose connections are 3-inch, the maximum suction lift close to 30 feet and the maximum discharge head 40 feet. The complete unit measures 54 inches long and 31 inches wide.

Repairing Fractures in Manganese Steel by Welding

THE Experimental Division of the Lincoln Electric Co., Cleveland, Ohio, has made an interesting suggestion for repairing cracks in manganese steel castings. Such fractures, while rare, have presented a problem to the welder operator who finds that repairs made with high manganese electrodes lack sufficient tensile strength to hold the casting together under strain. The highest tensile strength gained in butt welds made with manganese electrodes was 30,000 pounds per square inch obtained with the use of the shielded arc electrode used for building up an abrasion-resisting surface on manganese steel. Welds with a tensile strength as high as 75,000 pounds per square inch may be made in manganese steel with an electrode of 18-8 stainless alloy, heavily coated to utilize the shielded arc principle. This stainless steel fuses perfectly and makes a very ductile weld.

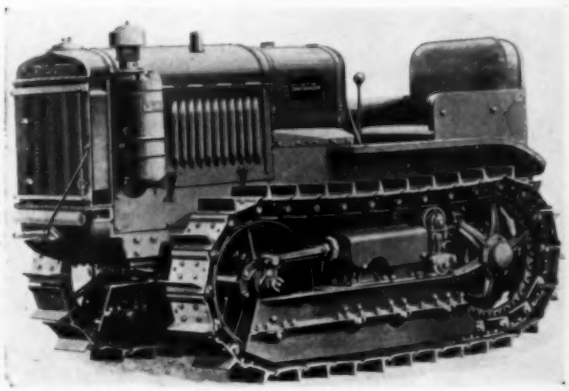
Metallurgically this practice is sound as both are Austenitic steels, and under the microscope are hardly distinguishable from each other. They possess many similar characteristics and differ mainly in their resistance to corrosion. The 18-8 deposit is also susceptible to pronounced workhardening. If the required section must withstand abrasion to the same degree as the rest of the part, it is altogether feasible to deposit in a shielded arc, manganese steel on the 18-8 deposit. Experiments were conducted with all the well-known high manganese electrodes and satisfactory results, both in butt welding and building up, were obtained with two shield arc electrodes, Stainweld A and Manganweld.

A New Model Crawler Tractor

A NEW crawler tractor, the Model T-20 TracTracTor, has been announced by the International Harvester Co. of America, Inc., 606 South Michigan Ave., Chicago, Ill. This tractor is especially designed for heavy construction such as road and levee building and maintenance work. The machine is compactly and ruggedly built. Its light weight per unit of track area and its power adapt it especially for work over fine sand, soft mucky soil and rough rocky places, and up and down slopes.

All controls are within easy reach of the driver and an unobstructed view ahead may be had from the tractor seat. The tractor is 112 inches long and turns within a circle of 6-foot radius. Unusual care was exercised to protect the working parts of the tractor against extremely dusty conditions. The bearings of the drive gear and pinion shaft are provided with specially developed diaphragm-type oil seals and the track rollers and idler bearings are also protected with oil seals of new design. Forty ball bearings are included in the machine, seven of which are in the engine. The transmission and final drive parts are mounted entirely on ball bearings. Like the other McCormick-Deering tractors, the new machine is of the triple-power type in that it provides power at the belt and drawbar and also through a power take-off for the operation of auxiliary equipment.

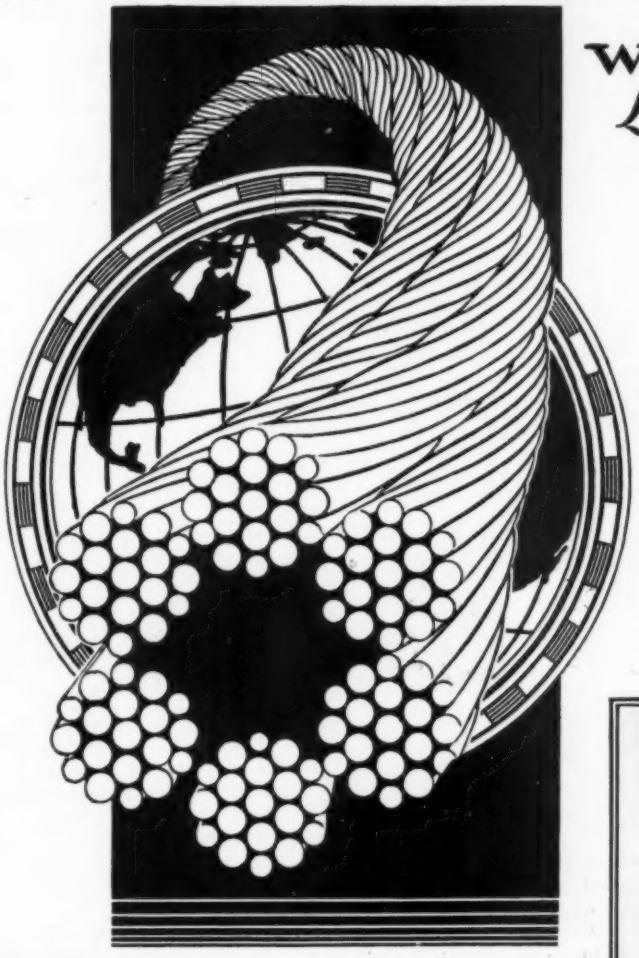
The large positive-acting, single-plate steering clutches are mounted in the rear compartment on the main frame. The steering clutch brakes are immediately to the rear of the clutches. Accessibility of working parts, easy removal of such units as the clutch, transmission, steering clutch brakes, etc., for inspection and replacement, and removable cylinders are featured. Kerosene may be successfully used as fuel. The tractor operates at three forward speeds, 1¾, 2¾ and 3¾ miles an hour and at 2 miles per hour in reverse. The tread width is 41½ inches, track ground contact is 52½ inches, the width overall is 55 inches and the height of radiator is 55 inches.



The New Model T-20 TracTracTor

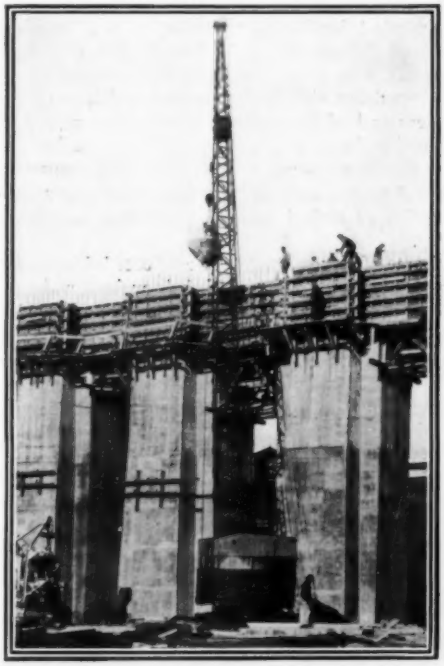
WILLIAMSPORT

wire rope *for Longer Service*



You can depend upon progressive engineers to find new, better ways of doing things—and when they do, it means we must meet these new conditions.

Our "Type W" rope is used with success on this McMyler super crane having an 82-foot boom for a special job.



Write us for literature introducing our new line of

MODERN
WIRE ROPE BLOCKS

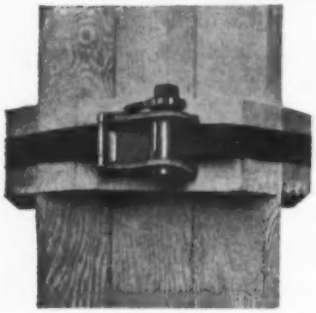
It will give you an idea of how we believe equipment should be made.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works
WILLIAMSPORT, PA.

General Sales Offices
PEOPLES GAS BLDG., CHICAGO

A Clamp for Concrete Column Forms



One-A-Minute Column Clamp

THE W. A. K. One-a-Minute column clamp is designed and manufactured by W. A. Kuhlman & Co., Toledo, Ohio, to meet the need for a light yet strong clamp for concrete column forms. This clamp is made of tough malleable iron only 4 x 4 inches overall and weighs 1½ pounds. It is used with a piece of strap iron of suitable length to go around the column and is then drawn tight with the drum of the clamp and locked by the pawl. There are only three parts to the clamp, the body, drum and pawl.

The One-a-Minute clamp is easily and speedily placed on the columns and removed. The strap iron may be used over and over again on forms of the same size or smaller. It is strong enough for any columns, is adaptable to all shapes and sizes and leaves no projections to interfere with the work.

A Mechanically-Operated Rotary Scraper

THE Model DA Atlas rotary power scraper which is simple in design, rugged in construction and easy to operate behind any tractor, has recently been announced by the Atlas Scraper Co., 6203 Maywood Ave., Bell, Los Angeles, Calif. This scraper is mechanically operated by means of a powerful but simple transmission which can be attached to the rear end of any crawler-type tractor with a propeller shaft running back to the bowl of the scraper, giving the operator absolute control at all times. The transmission consists of a 2-way clutch, and the bowl can be put into a digging position or rocked back to a complete carrying position with ease.

The frame of this scraper is of reinforced double steel channel construction, electrically welded throughout and has a clearance of 32 inches. The bowl is also electrically welded and is built extra deep for the maximum load. It works similarly to any drag type scraper. It is possible to dump the load, when going forward, in one pile or spread the dirt as thick or as thin as desired while the scraper is in operation.

One of the features of this scraper, according to the manufacturer, is its accuracy in both grading and spreading. Positive control from the driver's seat makes possible any depth of cut from 1 to 13 inches. The material can be dumped in a pile or spread accurately and smoothly in layers from 1 to 13 inches in thickness. The thickness of the spread can be changed while the scraper is in motion.

The wheels are of the drum type 32 x 8 inches in size, the use of which means that 85 per cent of the total weight is rolled rather than dragged. This scraper has reversible plow steel runner shoes for use while spreading.

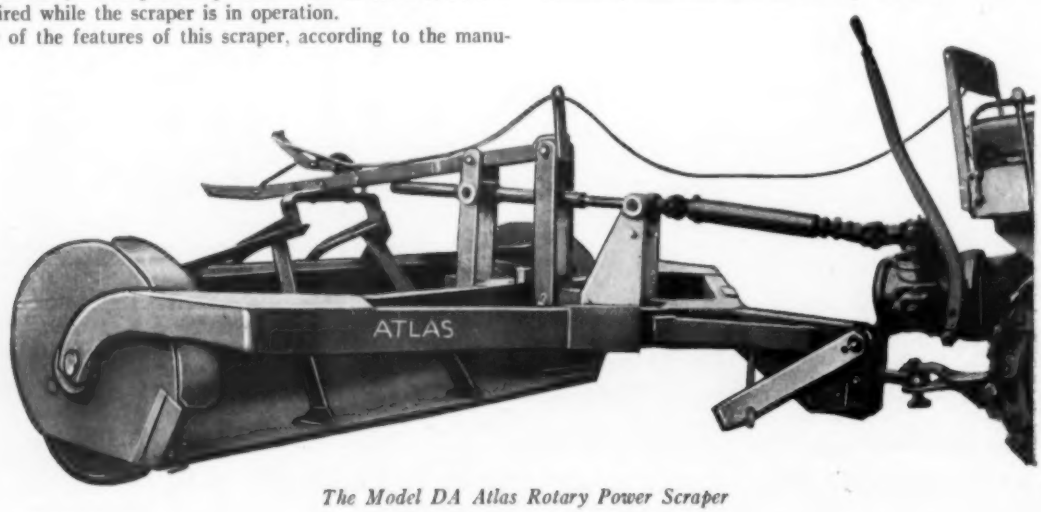
An Agitator Body for Ready-Mixed Concrete

A NEW spring blade agitator body, designed for the transportation of ready-mixed concrete, has recently been announced by the Hug Co., Highland, Ill. This body consists of an open top, cylindrical steel tank or body, the inside walls being perfectly smooth. The body is not of the revolving type but can be raised or lowered by means of a power hoist. The agitation of the concrete is effected by four

The New Hug Spring Blade Agitator Body Mounted on a Roadbuilder Truck

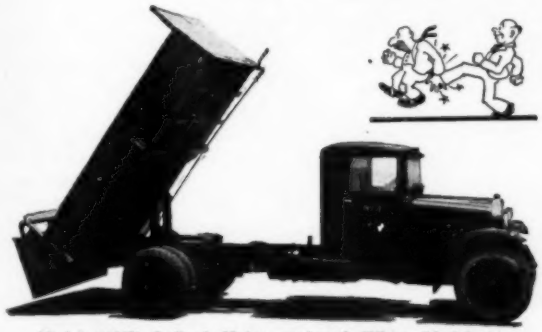
spring blades attached to a shaft that runs through the center of the body, the shaft rotating the blades through the concrete. The power used to drive the agitator is furnished by a 3-horsepower independent motor attached to the side of the body. Due to their spring action, the blades continually clean the sides of the body, preventing any accumulation of material on the sides.

The Hug spring blade agitator body is furnished in 2 and 3-cubic yard capacities, the latter weighing less than 3,000 pounds. The body is also equipped with a special discharge gate, making it possible to discharge a partial load of any desired quantity. This gate is water-tight and by the operation of a simple lever the amount of the concrete discharged can be increased, decreased or immediately cut off.



The Model DA Atlas Rotary Power Scraper

Chevrolet 131 WB Chassis with Type 454 1½-cu. yd. body equipped with Model 35UB St.Paul Underbody Hydraulic Hoist for the City of Indianapolis, Park Department, by Condit Equipment Co. of Indianapolis.



Model 85UB St.Paul Hoist equipped White Model 58, 180" WB with special rubbish body by Ohio Truck Body and Wagon Co. of Cleveland, Ohio. One of a fleet of trucks owned by City of Shaker Heights.

St.Paul Certificate of Service St.Paul

We warrant equipment manufactured by us to be free from defects in materials and workmanship for the entire duration of its active life. We will replace free of charge any parts returned to us, transportation charges prepaid, and which are determined by us to be defective regardless of age of the equipment.

This warranty will not apply to any damage or failure resulting from misuse, neglect, accident, or redesigning of assemblies or from any other cause beyond the control of the manufacturer. It will also not apply on Hoist Equipment that has been loaded beyond the factory maximum rated load capacity

St.Paul Hydraulic Hoist Company

Certificate of Service furnished to purchasers of St.Paul Hoists.

"The Gate" for "Alibi Ike"!

"Give him the gate" is slang for *kicking him out.* That's what we did long ago with "Alibi Ike" and his large family. When it comes to St.Paul Hoists you can forget the alibis. There aren't any. And when your faithful truck is giving its last gasp of service, your St.Paul Hoist will still have lots of life. Sounds like braggin'—it is! We're mighty proud of St.Paul Hoists.

"Ask the Dump Truck Driver on the Job"

St.Paul

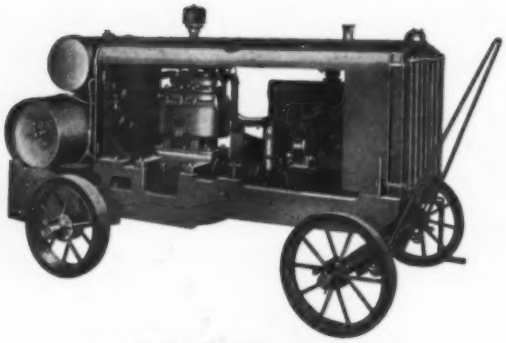
VERTICAL AND UNDERBODY HYDRAULIC HOISTS

St.Paul Hydraulic Hoist Company

Factories at St. Paul, Minnesota

A St.Paul Hoist Distributor and Service Station is near you. Write for name and address.

During February we hope you will remember to mention CONTRACTORS AND ENGINEERS MONTHLY.



A Curtis Portable Compressor

A New Line of Simplified Air Compressors

A COMPLETE new line of industrial compressors known as the Curtis Model C Timken bearing compressor has been placed on the market by the Curtis Pneumatic Machinery Co., St. Louis, Mo. The complete line consists of seven models, five of the 2-cylinder type, ranging in size from 4¼ x 3¾ to 6½ x 5, with a displacement of 25 to 125 cubic feet, and two of the 4-cylinder type, a 5½ x 5¼ and 6½ x 5¼ size, with a displacement of 115 to 262 cubic feet. The compressors are designed principally for use on road and building construction and are furnished not only as stationary simple compressors for belt drive from a line shaft, separate motor, steam engine or other prime mover, but are also furnished as complete self-contained units, either direct-connected or driven by a multiple V-belt. The compressors are likewise supplied with support wings instead of base mountings when incorporated in portable units.

Among the features of the Model C compressor are the carbon-free valves, the use of Timken bearings on the crank shaft and the Curtis Centro-ring oiling method. The valves are of the light disc type, double heat-treated and made of rust-resisting metal. The small individual non-warping valves have single large non-obstructed ports and are carbon-free. The head design of the compressor has made possible the carbon-free feature. This is accomplished by delivering air into the cylinder at the lowest possible temperature and maintaining the piston and cylinder walls at a minimum temperature. This low air temperature is assured by having large diameter, short intake passages, large ports and a straight line air flow. Carbon formation on the valves is further reduced because neither the crankshaft, counterweights, nor connecting rods ever touch the bath of oil. As a result the oil in the crankcase is not beaten up into a foam or froth and cannot flood the cylinders.

The oiling of the Model C compressor is provided for by the Curtis Centro-ring oiling method. A large diameter ring operating at slow peripheral speed carries oil to the crankshaft midway between the bearings, from which it is delivered by centrifugal force through large oil ducts to each throw, thereby oiling the connecting rod bearings under constant pressure feed. The large steel ring is the only moving part of this system. As long as there is oil in the crankcase, the compressor will lubricate as there is neither pump nor gears to wear nor any small pipes to clog. Because the oil ring is in the center of the crankcase, the compressor will lubricate even when a machine is at an angle of 15 degrees.

A Self-Propelled Road Metal Re-Worker for Secondary Roads

A NEW type of machine for picking up from the road such gravel as has been previously bladed into a windrow, elevating, crushing, screening and returning it to the road has been developed by the Rogers Iron Works Co., Joplin, Mo. This machine is built to efficiently reduce and size the material of old macadam roads for reconstruction purposes, also for the maintenance of gravel roads of all types where the accumulation of oversize material is a source of trouble to the maintenance department and a hazard to motor traffic.

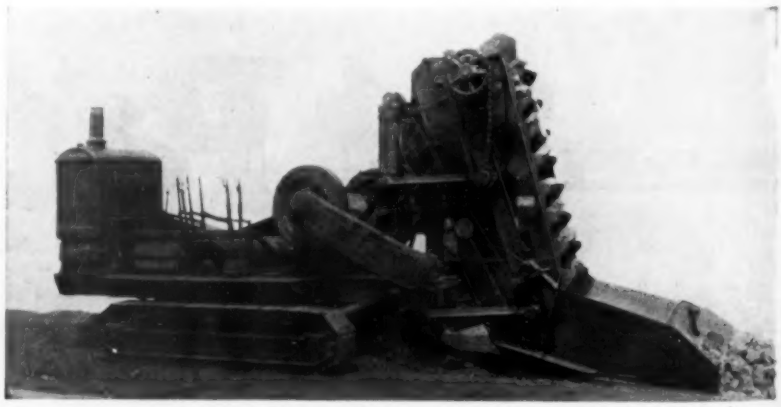
The machine which is self-contained, self-propelled and self-feeding is built in either the crawler or wheel type. The crawler type is adapted to new construction where road beds may be soft, and is furnished with a speed range of 4½ feet per minute to 2 miles per hour. The wheel-type machine is more adaptable to maintenance work where a firm road bed exists. This machine is lighter and more mobile. Its speed range is from 8 feet per minute to approximately 10 miles per hour.

The loading elevator for picking up the windrow material is of heavy construction with a specially designed boot, the flaring sides of which direct the material into the path of the loader. After the boot has passed over the road, the surface is left free from any appreciable amount of oversize material.

After the material is picked up by the loader it is elevated and delivered for reduction to the crusher which discharges onto a shaker screen. The undersize product drops onto the road forming a windrow of specification material beneath the machine. The oversize material is passed forward into the boot of the loader from where it is again picked up, elevated and delivered to the crusher. In this way a closed circuit is maintained which precludes any possibility of oversize material being placed on the road surface.

Although the crusher is powered from the same plant which furnishes power for the road movement of the machine, its operation is independent and it may be started or stopped at will.

Another feature incorporated in the machine is a conveyor mounted underneath the screen discharge, and extending to the rear. In operation the material from the screen falls on the conveyor belt which discharges into a bucket elevator mounted on the rear of the machine. The elevator is of the proper height to permit stockpiling or loading into trucks. This feature permits the use of the machine at a stockpile or at any point where there is an accumulation of road material to be crushed.



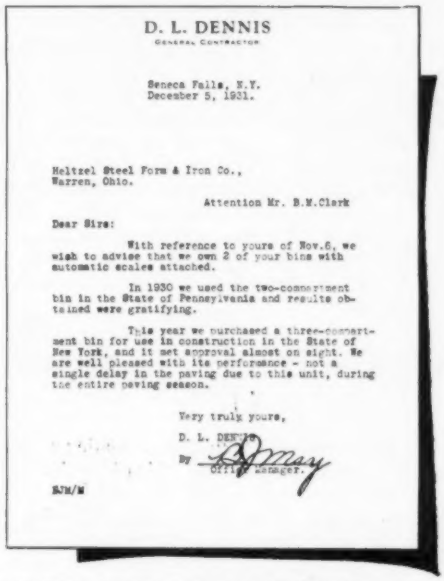
The Rogers Self-propelled Crushing and Screening Unit for Road Work

Road Builders prefer

Heltzel Steel Bin

HELTZEL
ROAD EQUIPMENT

. . . . because



D. L. DENNIS
GENERAL CONTRACTOR

Seneca Falls, N.Y.
December 5, 1931.

Heltzel Steel Form & Iron Co.,
Warren, Ohio.

Attention Mr. B.M.Clark

Dear Sirs:

With reference to yours of Nov.6, we wish to advise that we own 2 of your bins with automatic scales attached.

In 1930 we used the two-compartment bin in the State of Pennsylvania and results obtained were gratifying.

This year we purchased a three-compartment bin for use in construction in the State of New York, and it met approval almost on sight. We are well pleased with its performance - not a single delay in the paving due to this unit, during the entire paving season.

Very truly yours,

D. L. DENNIS

By D. May
Office Manager.

EJH/M

THE HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO

Service and Satisfaction are Certain

STANDARD
(Socony Brand)
Asphalt Products

Standard Cut-Back Surfacing Asphalt.
Standard Asphalt Binder A for surface treatment.
Standard Asphalt Binders B and C for penetration work (Asphalt Macadam).
Standard Paving Asphalt 51-60 and 61-70 Penetration for the mixing method. (Asphaltic Concrete.)
Standard Cold Patch Asphalt for all types of patching.
Standard Refined Asphalt for sheet Asphalt paving.
Standard Asphalt Joint Fillers.
Standard Waterproofiing Asphalt.
Specifications and all other particulars furnished on request.

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ASPHALTS AND ROAD OILS
STANDARD OIL CO. OF NEW YORK

STANDARD OIL COMPANY OF NEW YORK, INC., 26 BROADWAY

Three New Diesel Locomotives

THREE new models of Plymouth diesel locomotives have recently been added to the already extensive line of locomotives manufactured by the Fate-Root-Heath Co. (Plymouth Locomotive Works), Plymouth, Ohio. These are known as Model FLD, a 6-ton unit equipped with a 3-cylinder 36-horsepower engine; Model DLD, an 8-ton equipped with a 4-cylinder 48-horsepower engine and Model DLD 10-ton equipped with a 6-cylinder 72-horsepower engine. These locomotives are equipped with Cummins diesel engines.

Plymouth diesel locomotives are now available in all sizes from 6 to 80 tons, to meet the requirements of practically any haulage problem.

An Oscillating Traction Unit

AN entirely new super-powered oscillating traction unit, known as the Octopus, and which is designed for light or heavy fast maintenance or construction work has recently been announced by the W. A. Riddell Co., Bucyrus, Ohio. The Warco Octopus has eight pneumatic-tired wheels, four on each side and can be furnished with either standard diamond tread heavy-duty truck-type tires or the Goodyear lug-type tires. It is made in two sizes, the smaller to fit the McCormick-Deering Model 20, the Case Model CI and the Allis-Chalmers Model U tractors while the larger is made for the McCormick-Deering Model 30 and Case Model LI tractors.

A Rear View of the New Warco Octopus

The power of the tractor is transmitted to the wheels through a set of hardened steel gears in a grease tight and dirt-proof gear case located between the inner and outer sets of wheels on each side, thus exerting equal power to each wheel and making it possible for one wheel to spin or lose traction without all four wheels on that side spinning. The unit is also free to oscillate around the tractor axle which engages the main drive gear of the Octopus in the center of the gear case. This enables the unit to travel over uneven surfaces, affording maximum traction by continued ground contact of the wheels.

A New Bituminous Pre-Mixing Plant

INCREASING interest in low cost road construction has developed new equipment for the production of material used in paving city streets, county roads and secondary highways. Among these is the new bituminous pre-mixing plant, manufactured by the Chausse Oil Burner Co., Elkhart, Ind., for the production of bituminous or asphalt paving mixes for either hot or cold road application.

This machine, which is a complete asphalt plant, is built in two units, both mounted on steel wheels with solid rubber tires, making them readily portable. One unit is the drier, equipped with oil burners. Aggregate is fed directly into a large hopper from which it passes into the rotating drier where it is dried, heated to the required temperature and discharged into the bottom of an elevator attached to the other unit. The

The New Chausse Pre-Mixing Plant

second unit is the mixing half of the outfit. The elevator raises the heated aggregate and discharges through a self-measuring device into a continuous blade type pug mixer. At the same time, bituminous oil or asphalt which is heated in the 950-gallon tank, also equipped with oil burners, is pumped through a measuring device connected to the aggregate measure. This is adjustable so that any amount of bitumen up to 12 per cent can be admitted into the pug mixer. The essential elements are thoroughly mixed in the pug mill, which is 9 feet long. The finished hot stuff drops into a storage bin with a movable bottom gate, operated by the truck driver.

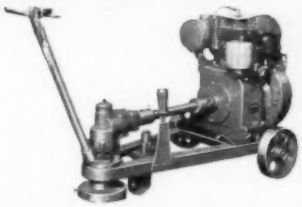
This Chausse machine is equipped with two Hercules industrial-type gasoline engines, one of 30 horsepower and the other of 40 horsepower, Twin Disc clutches, Cotta reducing transmissions, Geneva steel wheels, Goodrich solid rubber tires and a Worthington air compressor. The entire machine weighs about 26,000 pounds. About a day is required to set up the machine for operation and about half a day for movement to a new location.

This Model PM-2 will pre-mix the essential materials hot, for either cold or hot laying. Where a paving mix is desired which is mixed cold, the drying and heating unit may be omitted and only the mixing unit used. According to the manufacturer, this machine makes possible a complete roadway at a cost of about $1,500 per mile per inch of compacted thickness, 20 feet wide.

A New Manufactured Stone

A SCIENTIFICALLY manufactured stone, known as Vibrastone, is being made in the new plant of the Benedict Stone Products Co., 122 So. Michigan Ave., Chicago, Ill., a company associated with the Massey Concrete Products Corp., Chicago, Ill. This stone is made of cement and crushed stone, treated by a new and entirely different process and in appearance resembles granite, marble or other quarried stones. It is available in a wide range of colors, combining beauty with the advantages of reinforced concrete. It is light in weight, fireproof, durable, and has a compressive strength in excess of 10,000 pounds per square inch with a correspondingly low absorption.

The Rear Screed of an Ord Finishing Machine Showing the Character of the Surface Before Rolling



IMPORTANT

savings are assured when you use the BERG Hi-way Surfacer to cut down surface irregularities from concrete and concrete-asphalt highways. Because of the great speed of the cutter plate, larger areas of finished surface are produced quicker and better than by other tools or methods. One man with a BERG can do the work of ten.

Years of successful operation throughout the country have definitely proved the superiority of the BERG. Used and endorsed by leading contractors, engineers, state and municipal authorities.

Every progressive road builder should include the BERG in his equipment. Complete details mailed on request—write

THE CONCRETE SURFACING MACHINERY CO.
Pioneer Manufacturers of Concrete Surfacing and Metal Cleaning Machines
4539 Spring Grove Avenue Cincinnati, Ohio

BERG
HI-WAY SURFACER

WOOD HOISTS & BODIES

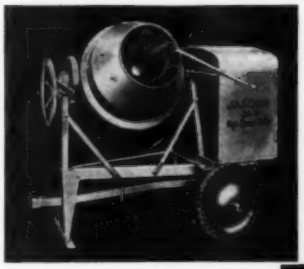
Jaeger adopts WOOD Hoist for Truck Mixer

Wood hoists, already most widely used, are given still another job in the contracting field! Jaeger Machine Company found the spouting area of mixers and agitators could be increased 75 per cent by hoisting the rear end. And they picked WOOD for standard equipment. Concrete forms can be filled at distances beyond accessibility of ordinary mixers. Also, discharge into ground hoppers is possible, as pictured.

A 1½-cubic yard Jaeger mounted with Wood F2C hoist on a Ford chassis. Hoist provides 33-inch to 35-inch raise above normal position.

WOOD HYDRAULIC HOIST & BODY CO.
BRANCHES, DISTRIBUTORS IN PRINCIPAL CITIES
DETROIT, MICHIGAN, U. S. A.

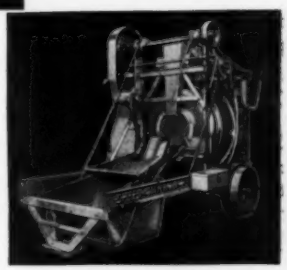
JAEGER *offers* MORE *for* YOUR MONEY---



---*in* "Dual-Mix" Tilters *at* $169 *up:*

half-bag trailers and 3½S, 7S, 10S power loaders with double the mixing action of any other tilter made.

---*in* Non-Tilters *that Outperform all Others:* from SPEED KING 7S trailer to 56S, a size and type to fit your job and handle it to best advantage.



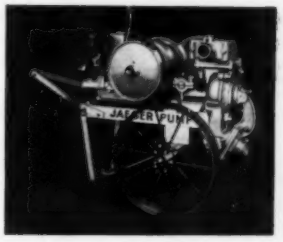
---*and in Improved* PUMPS *at* LOWER PRICES!

From the 2", 10,000 gallon SPEED BOY Self-Priming Centrifugal ($181, f. o. b. Columbus), Jaeger Pumps offer improved performance at remarkably low prices—an opportunity to save real money on your drainage work this year.

Self-Priming Centrifugals, Convertible Diaphragms (at no extra cost), Plunger Lift and Force, Standard Centrifugals—all sizes.

Attractive prices on Hoists, Placing Equipment

2", 10,000 Gallon Speed Boy



Get this Catalog before Buying

THE JAEGER MACHINE COMPANY,
701 Dublin Ave., Columbus, Ohio

Send latest catalogs and prices on Jaeger ☐ Mixers, ☐ Pumps, ☐ Hoists, ☐ Jaeger-Lakewood Placing Equipment,

Name_____

Address_____

The Whitcomb-Lehmer Road-Shoulder Finishing Machine

An Improved Road Shoulder Finishing Machine

SEVERAL new and interesting features have now been available on the Whitcomb-Lehmer road-shoulder finishing machine, a product of the Whitcomb Locomotive Co., Rochelle, Ill. One of these is the use of a new vehicle, the Hug truck. With this mounting, the power output is 100 horsepower and a low gear ratio permits a much slower operating speed, making it possible for the shoulder dirt to be handled in great volume. This truck is furnished for either left or right hand drive, the latter affording excellent visibility and giving the operator accurate control over the actual shoulder finishing work.

In the shoulder finishing device, there has now been made available an adjustable boom tip which permits variations to take care of all ditch contours from 1½:1 to level without dismantling the original tip and installing one for different contours. Adjustment is provided by means of an adjusting rod on the upper boom members and a locking slide located midway between the upper and lower members. A method of taking care of the gaps in the boom members proper, which result from the varying positions possible, is afforded by a flat idler pulley on the lower boom member and an idler sprocket on the upper. The new boom tip is so designed that it is available for replacement on rigid boom machines already in service.

An hydraulic hoist and turnbuckle member makes it possible to elevate or lower the main shoulder section of the machine to any desired position.

Manila Rope Important on Construction Work

MANILA rope is made from the abaca plant, a branch of the banana family which produces a fibre 8 to 12 feet long. There are many different grades of manila rope, the variations being in the source of the fibre. Those coming from the center of the leaf sheaths or stems are finer and very light in color. Toward the outside the fibre grows coarser, more brittle and darker colored. The life of the rope depends as much on the construction as on the fibre and lubrication. The fibre must be treated with the proper lubricant, the yarns firmly spun and uniform in size, with just the right amount of twist for tensile strength and abrasive wear. Rope should be large enough to take care of the working strain which is one-fifth of the tensile strength.

Various other precautions should be taken by the rope user. He should avoid overloading the rope as this cracks and breaks the center yarns of the strands and shortens the life of the rope. The blocks and pulleys should be large enough to permit free running of the rope at all times. Undersized pulleys chafe and wear the rope on the outside surface and often injure the strands. Ropes should be examined periodically for signs of wear or injury. If a rope shows signs of injury or overloading, it should be replaced with a new rope and the old rope used on lighter duty. Rope should never be subjected to sudden loads or strains.

Fitler pure manila rope made by The Edwin H. Fitler Co., Philadelphia, Pa., is distinguished by a blue and yellow colored yarn trade mark on the outside of the 5/8-inch diameter and larger sizes, and on the inside of the smaller sizes. The William Penn brand can be identified by a green and white yarn on the inside of all sizes. These two brands of Fitler ropes are treated with a colorless water-repellent compound, developed and used by the Fitler Co. for the past 35 years. These brands are also sea-treated with a water-repelling compound of a dark brown color, making them rotproof and waterproof as well. This treatment includes no graphite or coal tar and withstands the deteriorating effects of salt, fresh and polluted water. The Fitler Co. is the oldest rope manufacturer in the United States. It was founded in 1817 when all rope was made by hand but the same high standards of quality are maintained today when most of the operations from spinning the yarn to laying the strands together to form the finished rope are performed by machinery.

A New Hydraulic Dirt Mover

THE new Jumbo hydraulic dirt mover, recently developed by the Jumbo Scraper Co., 2440 E. 14th St., Los Angeles, Calif., is designed to reduce dirt-handling costs. It is adapted for hauling dirt long distances, building bridge approaches, hauling out of borrow pits, dumping over traps, hauling up or down hill, and other dirt moving jobs.

These scrapers are simple and strong in construction. They are operated by two cylinders, one of which governs the cut and lifts the bowl and load, while the other is used for dumping. The operation is hydraulic, power being derived from a pump connected to the rear power take-off of the tractor, and controlled by a special valve, the controls of which are mounted within easy reach of the operator. These scrapers are made in two sizes, Models 30 and 60, for 30 and 60-horsepower tractors. Model 30 has a bowl 7 feet wide, with a water measurement of 65 cubic feet. It will pick up the load and carry it 15 inches off the ground, pick up and transport in high gear about 2 yards, and will partly carry and shove about 4 yards. Model 60 has a bowl 9 feet wide, with a water measurement of 150 cubic feet. The capacity of this machine is about double that of Model 30. Both machines are equipped with removable bottoms in the bowl, and when the bottom is removed, the machine is then converted into a leveling machine.

The Jumbo Hydraulic Dirt Mover Carrying a Load of Better Than 2 Yards

McKIERNAN-TERRY *now*

Manufactures a Varied Line of Equipment

McKiernan-Terry Drill Division

Lambert-National Division

Steele & Condict Division

FOR many years McKiernan-Terry Pile Hammers have served contractors, driving and pulling piles on difficult jobs. Now McKiernan-Terry is in a position to furnish contractors dependable hoists and derricks for pile driving work and general contracting.

The Lambert-National line of hoists, steel and wood derricks, whirlers, etc., is very complete, consisting of all types and sizes. If your job requires a special hoist or derrick of any kind, McKiernan-Terry Engineers will design and build to suit your individual requirements. Your inquiries for any of the above equipment are earnestly solicited. Write for descriptive catalogs.

McKIERNAN-TERRY CORPORATION
19 Park Row, New York
Representatives in Principal Cities

GASOLINE, ELECTRIC & STEAM HOISTS

STEEL DERRICKS
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DREDGE HOISTS

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HEAVY DUTY TRAILERS
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508 East 19th St. New York, N. Y.

HVASS BITUMINOUS DISTRIBUTOR

ONE-MAN Schaefer CLEVELAND AUTOMATIC

Tractor Scraper

Nearly 10,000 in Use All Over the World

A STURDY BUILT LABOR SAVING UNIT

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The GUSTAV SCHAEFER CO.
4180 Lorain Avenue Cleveland, Ohio

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5 New

"CHAMPION"

5/8-yard

POWER SHOVELS & DRAGLINES

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These especially selected catalogs and pamphlets of value to contractors are for free distribution.

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A Portable Tool Box

470 The HanDeeBox, a tool box with an arrangement of compartments and shelves to take care of the most complicated collection of tools and equipment, of all steel construction and lighter than wood, with double covers, two pneumatic tired wheels and Timken bearings, for municipal departments and contractors is described in Bulletin No. G-6 which may be secured from Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio.

An Automatic-Priming 220-Pound Pump

471 The Ejectoprime, an automatic pump readily handled by one man and equipped with a gear-driven self-starter capable of handling 9,240 gallons per hour and having a 2-inch suction and 2-inch discharge, is described in the literature of the Sterling Machinery Corp., 2303-7 Holmes St., Kansas City, Mo.

A Self Loader for Portable Crushers

472 A cleated conveyor belt, with skirt boards, driven from the crusher and capable of loading 90 to 150 tons of rock per 10-hour day to a portable crusher, has been placed on the market by the Day Pulverizer Co., Knoxville, Tenn. Complete information regarding this unit may be secured direct from the manufacturer.

A Convertible Excavator

473 The Hanson Clutch & Machinery Co., Tiffin, Ohio, will be pleased to send to interested contractors full details regarding the Hanson excavator which may be used as a shovel, clamshell, trench hoe, skimmer, crane or for dragline requirements.

An Asphalt Mixing Plant

474 Bulletin 92, describing the Coatesville asphalt mixing unit, consisting of a structural steel tower in which is mounted all of the necessary equipment for mixing asphalt pavement, and which is made in three sizes of 1,400, 2,000 and 4,000 pounds hourly capacity, may be secured by those interested from the Coatesville Boiler Works, Asphalt Equipment Department, 50 Church St., New York City.

A 2-Inch Self-Priming Centrifugal on a 2-Wheel Truck

475 Novo Engine Co., 216 Porter St., Lansing, Mich., will send a complete description of the new Novo 2-inch self-priming centrifugal pump mounted on a handy two-wheel truck to any contractor who is interested in a self-cleaning, self-priming pump that can be moved readily around the job by one man, in spite of its weight of 500 pounds. The capacity varies from 220 gpm at 20 feet to 110 gpm at 50 feet total head.

A Rear-Lift Hoist for Truck Mixers

476 Bulletin TM-31B issued by the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, completely describes the new Jaeger rear-lift hoist attachment which increases the spouting area of the machine 75 per cent and eliminates the need of ramps on many special jobs.

New Medium Pressure Welding Blowpipes

477 The Linde Air Products Co., 30 East 42nd St., New York, will be pleased to furnish information regarding its two new welding blowpipes for medium pressure apparatus, which offer interchangeability through a detachable valve body and a variety of tips.

High Efficiency Air Filters

478 The latest literature of the Staynew Filter Corp., Rochester, N. Y., describes Protectomotor air filters for construction machinery and air compressors, pipe line filters for compressed air and vacuum lines and the Protectovent self-contained ventilating unit for offices and hospitals.

Tractors for Big or Little Jobs

479 Complete information in regard to the line of Cletrac crawler tractors in five sizes from 15 to 80 horsepower to meet every job need, large or small, may be secured by interested contractors from the Cleveland Tractor Co., 19321 Euclid Ave., Cleveland, Ohio.

A New Air-Operated Sump Pump

480 A new centrifugal sump pump known as the Cleco-Deming pump produced and marketed by the Cleveland Pneumatic Tool Co., Cleveland, Ohio, contains many exclusive features which are described in detail in literature which may be secured from the manufacturer.

A Mixing and Leveling Drag for Mulch Work

481 The Galion mixing and leveling drag, a development of the multiple blade maintainer, which is especially designed for mulch or retread work, is completely described in literature of the Galion Iron Works & Mfg. Co., Galion, Ohio.

Costs and Prices of Ready-Mixed Concrete in 20 Plants

482 A genuine contribution to the ready-mixed concrete industry has been made by the Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis., in its booklet bearing the above title. This booklet is filled with costs, tabulations and good hard business sense and may be secured free from the manufacturer upon request.

A 1/3-Yard Crawler Shovel

483 The Fundom Hoist & Shovel Co., Lima, Ohio, will be pleased to send to contractors complete information regarding the Fundom shovel, a 1/3-yard machine with full crawlers and built to operate economically and with low up-keep cost.

A New 30-Pound Drill

484 Bulletin 87-I recently issued by the Sullivan Machinery Co., 814 Wrigley Bldg., Chicago, Ill., describes a new light weight rock drill which weighs only 30 pounds and is only 17 inches long. It is adapted for light ledge drilling, block holing, plugging for secondary shooting and will handle ⅞-inch standard steel up to 6 to 8 feet deep.

A Bigger Capacity Leaning Wheel Grader

485 Bulletin 1238 published by the Austin-Western Road Machinery Co., 400 No. Michigan Ave., Chicago, Ill., describes the new Austin 101 leaning wheel grader which has greater strength, capacity, visibility and flexibility.

Stationary and Semi-Portable Asphalt Plants

486 The New York Central Iron Works Co., Inc., Hagerstown, Md., has prepared a loose leaf catalog of its complete line of hot and cold-mix stationary and semi-portable asphalt plants with full equipment for municipalities and for the use of asphalt paving contractors. A copy of this booklet may be secured free on request.

Two New Convertible Shovels

487 Literature describing the two new convertible shovel-dragline-crane-clamshells, Model 32-B 1-yard machine and Model 21-B ¾-yard machine, both of which can be operated by gasoline, diesel or electric power, may be secured by interested contractors from the Bucyrus-Erie Co., South Milwaukee, Wis.

A Heavy-Duty Tractor-Mounted Hoist

488 The Seminole hoist, which is mounted on a Trackson-equipped tractor and is designed to meet the need for a portable hoist on heavy work, is described in literature which the Resistcor Engineering Corp., Muskogee, Okla., will be glad to send on request.

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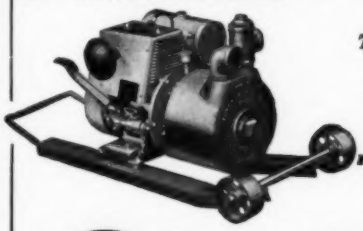

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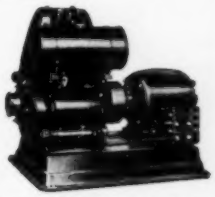

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Vertical and Underbody Hoists

489 St.Paul Hydraulic Hoist Co., St. Paul, Minn., will be glad to send to those interested a complete description, as well as the name of the nearest distributor, of St.Paul vertical and underbody hydraulic hoists for every make and model of trucks.

A Sturdy ⅜-Yard Shovel

490 Bay City Shovels, Inc., Bay City, Mich., will be glad to send to interested contractors complete information in regard to the Bay City Model B ⅜-yard shovel which is sturdy, full-revolving and has all the attachments, including shovel, crane, hoe, dragline, skimmer and clamshell.

Road Mix Machine Demonstrates Value

491 The Barber-Greene Co., 485 W. Park Ave., Aurora, Ill., will be pleased to send to contractors a complete description of the demonstration of the new B-G bituminous paving machine which consists of a Loader-Mixer and a Spreader-Tamper which is capable of laying better than a mile a day of 20-foot bituminous pavement, producing the completed pavement at the rate of about 16 feet per minute from a windrow of rock to a well tamped smooth-surface bituminous highway.

Steel Road Drags

492 Russell road drags made of all steel except the platform and reinforced with angle irons and built to afford effective maintenance are described in Catalog No. 30 which may be secured from B. W. & Leo Harris Co., University Avenue and 25th St., S. E., Minneapolis, Minn.

A 1¼-Yard Shovel

493 Marion Steam Shovel Co., Marion, Ohio, will be glad to send to interested contractors literature describing the Marion Type 450 1¼-cubic yard shovel, dragline, clamshell and crane which may be equipped with either gas or diesel engine.

Calcium Chloride for Curing Concrete

494 Bulletin No. 30-750 issued by the Columbia Alkali Corp., Barberton, Ohio, is a well-prepared instructive report on the current practice of using calcium chloride for curing concrete in pavements, building construction, bridges, culverts and concrete products. Copies of this bulletin may be secured gratis from the company.

An Automatic Trip for Power Shovels

495 A device to relieve the wear and tear on the shovel operator who gets mighty tired jerking the old fashioned trip rope all day long is made by the Morin Mfg. Co., 896 Main St., Holyoke, Mass. This Universal semi-automatic dipper trip can exert a pull up to 400 pounds which handles the most stubborn latch without one profane word.

Real or Paper Horsepower

496 This is the title of an interesting and well-illustrated booklet containing tables of Waukesha conservative power unit ratings for continuous heavy-duty service. Copies of this booklet may be secured by those interested from the Waukesha Motor Co., Waukesha, Wis.

A Line of Bituminous Equipment

497 Complete information in regard to Hvass bituminous distributors, heavy-duty trailers, sand spreaders, chip spreaders, sweepers, sprinklers and heating kettles, may be secured by those interested from Chas. Hvass & Co., Inc., 508 East 19th St., New York City.

Reliable Red Lanterns

498 Complete information in regard to Dietz red lanterns, among the features of which are burning dependability and lighting power, may be secured by interested contractors from R. E. Dietz Co., 60 Laight St., New York City.

A Complete Line of Asphalt Plants

499 Complete information in regard to the line of Simplicity asphalt plants, which are dependable, simple in construction, and made in a number of sizes and types to meet the various requirements in this field, may be secured by those interested from the Simplicity System Co., Chattanooga, Tenn.

A Cost-Cutting Pipe Cutter

500 The Ellis pipe cutter, which has six keen rotary cutting blades, and may be used for pipe from 4 to 12 inches in diameter, is described in literature which Ellis & Ford Mfg. Co., 32 Piquette Ave., Detroit, Mich., will be glad to send on request.

Expansion Joints for Every Weather Condition

501 Servicised premoulded expansion joints which protect concrete roads and other structures against cracking and self-destruction due to temperature and moisture variations are described in Catalog No. 11, which the Servicised Products Corp., 6051 W. 65th St., Chicago, Ill., will be glad to send on request.

Four Types of Buckets

502 The Hayward Co., 32-36 Dey St., New York City, will be glad to send to interested contractors, complete information in regard to its four types of Hayward buckets, including orange peel, clamshell, electric motor and dragline, for digging and rehandling jobs.

A Three-Way Dump Wagon

503 LaPlant-Choate three-way dump wagons, which with one man operation can dump either to the right, left or rear and are equipped with hydraulic control, are described in an illustrated folder which the LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Ia., will be glad to send on request.

All-Steel Hand Hoists

504 A descriptive circular covering Beebe all-steel hand hoists, with a straight-line capacity of 5 tons, positive internal brake, and two speeds, 4 to 1 and 24 to 1, may be secured by those interested from Beebe Bros., 2724 Sixth Ave., So. Seattle, Wash.

Dirt Moving Equipment

505 Complete information in regard to Trackson dirt-moving equipment, particularly its bulldozers and crawler dump wagons which are designed for reliable and heavy-duty service, may be secured by interested contractors from Trackson Co., 1323 So. First St., Milwaukee, Wis.

Electric Light Plants for Construction Jobs

506 Literature describing Onan electric light plants, for both D. C. and A. C. operation, which can be set in any convenient place, started and put in operation without the necessity of bolting to any kind of permanent base may be secured by those interested from D. W. Onan & Sons, 43-51 Royalston Ave., Minneapolis, Minn.

A Portable Power-Operated Double-Diaphragm Pump

507 The Parker-Adnun portable double-diaphragm pump redesigned and made more efficient than ever before is described in a triple illustrated folder which may be secured from the Adnun Engineering & Manufacturing Co., Nunda, N. Y.

A New Crawler-Type Tractor

508 The International Harvester Company of America, Inc., 606 So. Michigan Ave., Chicago, Ill., will be pleased to send a complete description and illustration of the new Model T-20 TracTracTor, a crawler mounted McCormick-Deering tractor especially adapted for heavy construction work and highway maintenance.

A New Bituminous Pre-Mixing Plant

509 Chausse Oil Burner Co., Elkhart, Ind., will be glad to send to interested contractors a complete description of the new Chausse Model PM-2 portable bituminous pre-mixing plant which is designed for the production of bituminous or asphalt paving mixes for either hot or cold road application.

A Light Line and Surface Level

510 Sand's-Stevens No. 555 new line and surface level, which is positive, attaches quickly to any line and which has a flat bottom surface for accurate surface leveling, weighs but a half-ounce, is only 3½ inches long, and is particularly adapted for layout work in foundations, walls, sewers, sidewalks, etc., is described completely in literature which may be secured from Sand's Level & Tool Co., 8631 Gratiot Ave., Detroit, Mich.

Multiple-Rope Clamshell Buckets

511 Literature describing the Williams Type MF clamshell bucket, among the features of which are the 6-reeving so arranged as to give a straight lead of closing cable, the long roller guards, the double quick-opening hinge and welded scoop, may be secured by those interested from the Wellman Engineering Co., 7012 Central Ave., Cleveland, O.

A Method of Coating Aggregate with Bitumen

512 The Saturmix plant, a machine for properly applying bitumen to aggregates, which is readily portable and has a capacity of 500 tons a day, is described in literature which the Saturmix Corp., Wooster, Ohio, will be glad to send to interested contractors or municipal officials.

Warning Lights for Construction Work

513 Literature describing Embury Supreme ruby globe lanterns for warning lights on construction work which are dependable in operation, rugged in construction and possess high lighting power may be secured by interested contractors from the Embury Manufacturing Co., Warsaw, N. Y.

A New Line of Simplified Air Compressors

514 A complete description of the new Curtis Model C Timken bearing air compressors in which the capacity of the compressor is considerably increased in relation to the size so that comparatively the prices are much lower than in previous models may be secured from the Curtis Pneumatic Machinery Co., St. Louis, Mo.

A New Light Weight Electric Hammer

515 A new electric hammer weighing only 9 pounds and operated through a special flexible shaft attachment connected with any light weight ½-inch electric drill has been placed on the market by The United States Electrical Tool Co., Department 95, 2490 West Sixth St., Cincinnati, Ohio. Complete information may be secured direct from the manufacturer.

A Clamp for Concrete Column Forms

516 Literature describing the W. A. K. One-a-Minute column clamp, which is easily and speedily placed on the columns and removed, is strong enough for any columns, is adaptable to all shapes and sizes, and leaves no projections to interfere with the work, may be secured by interested contractors from W. A. Kuhlman & Co., Toledo, O.

A New Oscillating Tractor Unit

517 W. A. Riddell Co., Bucyrus, O., will be glad to send to those interested complete information in regard to the new Warco Octopus, an oscillating traction unit which has eight pneumatic-tired wheels, four on each side and can be furnished with either standard diamond tread heavy-duty truck-type tires or the Goodyear lug-type tires.

A Finishing Machine for Bituminous or Concrete Roads

518 The Lakewood Type C road finisher for either bituminous or concrete pavements, which produces a smooth riding surface, saves labor and increases the daily production of pavement, is described in Bulletin No. 47-E, which the Lakewood Engineering Co., Columbus, O., will be glad to send on request.

An Attractive Calendar for 1932

519 Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill., will be glad to send copies of its attractive 12-page art gravure calendar, 24 by 15 inches, each page of which contains an illustration and the current, past and future months, to readers of CONTRACTORS AND ENGINEERS MONTHLY who send their requests on their business letterhead.

A New Track-Type Tractor

520 An attractive and well-illustrated booklet describing the new Caterpillar Twenty-Five tractor, among the features of which are power, traction, stamina and serviceability, which has recently been added to the Caterpillar line, may be secured by those interested from the Caterpillar Tractor Co., Peoria, Ill.

A Solder That Approaches a Weld

521 A solder that will repair aluminum and other metals, will not corrode, has a tensile strength of 12,000 pounds, is ductile, will take a polish and is applied with a soldering iron or blow torch has been announced by the Allied Research Laboratories, Glendale, Calif. A complete description of Alumaweld, the new solder, may be secured direct from the manufacturer upon request.